DISSERTATION

On

RANDOMISED PROSPECTIVE STUDY OF FETAL AGE ESTIMATION AT 15-40 WEEKS GESTATION BY USING USG GUIDED TRANSCEREBELLAR DIAMETER AMONG CASES OF NORMAL SINGLETON PREGNANCIES ADMITTED OVER A ONE YEAR PERIOD

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BONAFIDE CERTIFICATE

This is to certify that the dissertation titled **"RANDOMISED PROSPECTIVE STUDY OF FETAL AGE ESTIMATION AT 15-40 WEEKS GESTATION BY USING USG GUIDED TRANSCEREBELLAR DIAMETER AMONG CASES OF NORMAL SINGLETON PREGNANCIES ADMITTED OVER A ONE YEAR PERIOD AT THE DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY, GOVERNMENT KILPAUK MEDICAL COLLEGE, CHENNAI"** is a bonafide work done by **Dr.S.RENUKA**, Department of Obstetrics & Gynecology, Govt Kilpauk Medical College, Chennai – 10, in partial fulfillment of **THE TAMILNADU DR.MGR MEDICAL UNIVERSITY** rules and regulations for the award of **M.S.DEGREE** in **OBSTETRICS & GYNECOLOGY BRANCH-II**, under our guidance and supervision, during the academic period from May 2011 to April 2014.

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ABBREVIATIONS

CRL – Crown rump length

BPD – Biparietal diameter

HC – Head circumference

AC – Abdominal circumference

FL – Femur length

TCD – Transcerebellar diameter

OFD – Occipito frontal diameter

AN – Antenatal

GA – Gestational age

AIUM – American Institute of Ultrasound in Medicine.

ALARA – As Low As Reasonably Achievable

LMP – Last Menstrual Period

IUGR – Intrauterine growth retardation

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INTRODUCTION

Gestational age estimation is important for obstetrical practice as many a decision depends on this. For example, fetal growth assessment depends on correct estimation of gestational age, interpretation of certain antenatal tests, interpretation of antenatal biophysical testing and decision regarding timing of delivery is dependent on the gestational age.

Deliver Or Not To Deliver? This is often a big question faced by most obstetricians.

They are faced with this question under these circumstances,

- Will it be a premature delivery
- Is it really a post term pregnancy
- In cases of medical disease complicating pregnancy where there is a need for early termination

We all are aware, preterm delivery increases the perinatal mortality (almost 50% of neonatal deaths).[1] A premature infant is subjected to following complications, hyaline membrane disease, hypothermia, intraventricular hemorrhage, sepsis, Jaundice, retinopathy of prematurity, as well high incidence of cerebral palsy, sensory deficits, learning disabilities and respiratory illness in childhood.[2]

Likewise post term delivery has its own complications perinatalincludes meconium aspiration, intrauterine infection, macrosomia, post maturity syndrome, fetal hypoxia. “Perinatal morality rate is doubled at 42weeks and after that it is almost six fold.”[3] And in mother it leads to labour dystocia, perineal injury and cesarean delivery and associated risks. According to ACOG most common cause of post term pregnancy is error in gestational age assessment.[3]

As it is aptly said ultrasound is the third eye of obstetrician, ultrasound has revolutionized obstetric care as accurate assessment of gestational age is now feasible with sonography.[4, 5]

Fetal biometry refers to the use of fetal anatomical parameters both bony and soft tissue parameters as estimated by the ultrasound for the assessment of gestational age. The common ultrasound parameters that can be used for gestational age estimation are crown rump length, Biparietal diameter, Femur length, Abdominal circumference.[6, 7, 8, 9]

In normal scenarios we depend on CRL, BPD, HC, and FL for a conclusion. However in exceptional situations such as macrocephaly/microcephaly, limb dysplasia , engaged head in late pregnancy ,in cases of fetal growth retardation difficulty may arise and hence we need alternative reliable parameters which are a relatively

simple in technique, performed easily in everyday practice with good reliability.

Transcerebellar diameter measurement is highly accurate in estimation of gestational age especially in cases of unknown last menstrual period.[10]

The present study is undertaken to validate the Transcerebellar diameter (TCD) measurement as an isolated parameter is estimation of gestational age. This measurement is easy to take and can therefore be easily incorporated in to the model for dating pregnancies after 14 weeks of gestation, particularly when measurements of Biparietal diameter (BPD) and Head circumference (HC) are difficult

AIMS AND OBJECTIVES

1. To evaluate the role of transcerebellar diameter as a biometric parameter in the estimation of gestational age as against the conventional parameters of BPD, FL and AC in cases of normal singleton pregnancy.

2. To develop a nomogram and to compare with previously available nomograms and to select the most appropriate nomogram for the population served by our institution

REVIEW OF LITERATURE

BACKGROUND:

Pierre and Jacques Curie (1880) could be rightly called the titans of ultrasound as they were the ones to discover the piezoelectric effect, the basis of modern ultrasound.

The origin to the modern diagnostic ultrasound technique is based on the works of **Chilowsky and Langavin** SONAR (sound navigation and ranging) published in 1916, which was the first successful application of ultrasound.

It was **this pulse echo distance ranging** technique that became the basis for modern diagnostic medical sonography

In 1949, **Ludwig and Struthers** used pulsed echo ultrasound as medical imaging technique to detect gallstones and foreign bodies in soft tissue.

The usage of ultrasound in obstetrics dates back to the days of **Professor Ian Donald,** when he first came out with his discovery in lancet in 1958 of the usage of ultrasound in diagnosing pelvic mass. In the year 1960, automatic B scanner was completed with the help of which they were able to accurately measure the biparietal diameter and also published about the correlation between fetal biparietal diameters with gestational age. Later when accidentally

it was found out that with full bladder even the contents of a normal sized uterus can be studied paving way to study pregnancies as early as 5weeks.

UNDERSTANDING ULTRASOUND:

Ultrasound are sound waves beyond ordinary limits of hearing i.e. high frequency sound waves >20,000Hz .In other words they are mechanical energy which can be characterized as wave phenomenon .The ultrasound beams used in diagnostic imaging have frequencies ranging from 1 MHz to 20 MHz

They are similar to X-rays in that both are waves transmitting energies. But the major difference is X-rays pass through vaccum while ultrasound requires medium for propagation. X-ray is transverse in nature (compression and rarefaction causes the propagation of this sound waves) whereas ultrasound is a longitudinal wave. When ultrasound pulses are directed into a medium, it causes the particle in the medium to vibrate parallel to the direction of wave propagation, this process of transmitted vibration from particle to particle lead to propagation of ultrasound through medium. The most important vibration is back and forth motion along the longitudinal axis of beam. Once ultrasound wave has been generated it continues in its original direction until it interacts with tissues. Three possible interactions take place.

- Reflection:

  Reflection occurs at the interface between two dissimilar medium. It is dependent on the tissues acoustic impedance and the beam's angle of incidence.

- Refraction:

  Binding of waves as they pass from one medium to another is called refraction can cause artifacts. Refraction artifacts cause spatial distortion and loss of resolution in the image.

- Absorption:

  Energy is dissipated, in the form of heat.

Ultrasound wave is generated by the piezoelectric crystals lead zirconate titanate in the transducer (when voltage is applied in a sudden burst or pulse the crystals vibrate and generate sound waves)

As the sound pulse passes through the patient body it interact with tissue in accordance with the characteristics of targeted tissue. The results of these interactions are recorded for diagnosis in the form of ultrasound wave incident on a transducer.

The reflected waves are received by the transducer, these waves carry energy and they transmit the energy to the crystal elements. This compression forces the tiny dipole to change their orientation, which induces a voltage between the electrodes. The voltage is amplified and serves as the ultrasonic signal for display on an oscilloscope or television monitor.

ULTRASONIC DISPLAY

- Amplitude (A) mode: In amplitude mode echoes are displayed as spikes projecting from a baseline. On the amplitude mode, the display on the cathode ray tube contains information about the depth of structure and the amplitude of returning echoes. Provides only one dimensional information.

  A mode is used in ophthalmology, echoencephalography, and echocardiography
- Brightness (B) mode: This mode provides a picture of slice of tissue. Echoes are displayed as dots.
- Time motion (M) mode: The spikes are converted into dots which move back and forth with the movement of reflecting surface. Most useful in echocardiography and obstetrics.

- Grey scale imaging: the purpose of grey scale imaging is to display the great variation of amplitudes to echoes arising from tissues as varying shades of grey on TV monitor.

EQUIPMENT

Real-time equipment currently available varies greatly in size, shape and complexity, but will contain five basic components:

1. The probe, in which the transducer is housed
2. The control panel
3. The freeze frame
4. Measuring facilities
5. A means of storing images.

Transabdominal transducers:

Three types of Transabdominal transducers are used

- *Sector transducers*: These are ideal for first trimester pregnancy as accesses is limited.
- *Linear array transducers*: These provide excellent axial and lateral resolution and a longer field of view and are best utilized in second and

third trimester pregnancy. The large surface area required for skin contact may however be problematic.

- *Convex transducers*: These combine the advantage of both sector and linear transducers.

  The appropriate frequencies for all the above transducers lie between 3 and 5 MHz

Transvaginal transducers:

Transducer for Transvaginal scanning are either mechanically or electronically focused sector probes.

The mechanical sector transducer consists of one or more crystals that oscillate in oily medium. Electronically focused transducers are either phased array or curvilinear. Mechanical transducers are less expensive and can provide wide field of view. However, the near field resolution of mechanical transducers is often poor. Although more expensive, electronically focused probes usually have a better near field resolution and are more reliable. Mechanical probes have fixed focal zones, while electronically focused probes have fixed or multiple focal zones.

The physical component of probe include, the Handle (the part held by operator), the Shaft(portion which enters the vagina),Tip, head or footprint

(which houses the US crystal).most Transvaginal probes uses frequency in the range of 5 to 7.5 MHz scan angle may vary from 90 to 115 degree scanning angles.

BIOLOGICAL EFFECT OF ULTRASOUND AND SAFTEY CONSIDERATIONS

Physical effects of ultrasound can be divided into two groups

1. Thermal
2. Non-thermal

THERMAL EFFECTS

Ultrasound produces heat through the attenuation of sound as it passes through tissues, which in turn causes loss of penetration and inability to image deeper tissues. Factors controlling tissue heating include

- Spatial focusing
- Frequency of ultrasound
- Duration of exposure
- Tissue type.

NON THERMAL EFFECTS

Non thermal mechanisms can result in application of radiation forces (non-ionizing) both at microscopic and macroscopic level resulting in exerted pressure and torque. Acoustic fields can also cause induced motion to flow of fluids known as streaming.

Acoustic cavitation is action of fields which generates bubbles which undergoes volume pulsation and collapse in response to acoustic field. Other results of this activity are free radical generation, micro streaming around bubble and mechanical action from bubble collapse. Non thermal mechanism can generate heat as well.

SAFTEY CONSIDERATIONS:

Safety considerations have become more widespread since the use of diagnostic ultrasound has become more prevalent. This being more so for the obstetrics and neonatology, because the most sensitive targets exposed to ultrasound are the embryo or fetus.

The majority of the studies reported involve the interaction of therapeutic ultrasound with biological systems and very few with the diagnostic exposures. Therapeutic ultrasound uses continuous or tone burst exposures while diagnostic ultrasound uses short pulses.

Some data are available on the effect of above normal temperature of fetus or embryo although effects of hyperthermia on human fetus or embryo are not known. Other mammalian species seem to be susceptible to temperature rise during pregnancy.

The factors determining the effect hyperthermia is going to have depends upon stage of embryonic or fetal development, quantum of temperature rise and the duration .the hyperthermia induced death though possible at any stage is most likely to occur even before implantation. Probable mechanism for hyperthermia induced death is induced delay in the development of embryo or by change in the environment that is uterine secretions/nutrients.

The temperature rises of the order of 1.5 to 2.5° above normal can produce resorption, death, abortion or teratogenesis. Abortion as a result of hyperthermia is well known. The factor responsible for this are increased uterine activity and severe cellular damage. Hyperthermia is known to induce teratogenic effect in a number of species Viz, rats, sheeps, pigs, mice, etc. for this the temperature elevation should occur during crucial stage of organogenesis. The central nervous system seems to be most susceptible and the defects produced can be microopthalmia, neural tube defects, microcephaly and microencephaly.

Further it is thought on the basis of these studies that if embryo or fetus is effected by less than 1° temperature rise adverse effects outcome is less likely

and scanning can proceed as long as desired, however this is for the hyperthermia effecting whole fetus. Effects of selective heating of different regions of fetus as with Doppler ultrasounds have not been studied. It seems overall thermal considerations do not adversely affect the safety in pulse echo scanning while for Doppler ultrasound the caution that needs to be exercised is that examination should be kept as short as possible.

BIOLOGICAL EFFECTS OF CAVITATION

Cavitation refers to the activity of microscopic gas bubbles under the influence of ultrasonic field. Two types of cavitation are recognized to occur

- Stable cavitation: used to describe bubbles which oscillate in diameter with the passing pressure variation in sound waves. Streaming is an example of stable cavitation.
- Transient cavitation: occurs when bubble oscillations are so large that the bubble collapses, producing shock waves and localized high temperatures which have the potential for significant destruction.

Size of bubble and the characteristics of ultrasonic field determine the behavior of bubble and the outcome, there being a particular bubble diameter for a frequency for which the bubble becomes resonant. These bubbles grow

bigger and undergo explosion resulting in large temperatures and sheering stress, under the influence of powerful acoustic field.

In fluids the shearing stress may cause the cells in the vicinity to be lysed, where as in more structured tissue the movement and bubble oscillation is considerably dampened. The greatest hazard is from cavitation event occurring in the amniotic or body fluid close to developing embryo causing cell lysis and irreparable tissue damage.

Epidemiological studies in humans that have been done concern birth weight, fetal anomalies, neurological effects, childhood cancers and effect on hearing in children.[11, 12]none of these studies have provided any conclusive evidence of ultrasound induced abnormality. One isolated study not supported by others refers to incidence of low birth weight. Thus epidemiological data do not suggest the incidence of harmful effects of ultra sound in utero, though sample sizes used were small, but not even a few cases have been reported considering wide spread use of ultra sounds over years and years. No epidemiological data, whatsoever, is available on effects of Doppler ultra sound.

METHODS TO MINIMIZE THE HARMFUL EFFECTS:

Thermal effects are more when the acoustic output intensity, exposure time and ultra sound frequencies increased. For cavitation crucial factors are peak

negative pressure, pulse length, pulse repetition frequency and exposure time. All these can be minimized by

1. Setting machine on default output settings.
2. Keeping the time for which transducer is in contact to minimum.
3. Keep acoustic output at the minimum consistent with good results.

The general consensus as stated by American institute of ultra sound in medicine (AIUM) bio effects committee is that "no confirmed biological effects on patients or instrument operators caused by exposure at intensities typical of present diagnostic ultrasound instruments have ever been reported. Although the possibility exists that such biological effects may be identified in the future, current data indicate that the benefits to patients of the prudent use of diagnostic ultrasound overweight the risk, if any that may be present."[13]

A single routine screening ultrasound in a clinically normal pregnancy is usually recommended between 18 to 20 weeks of gestation and scan time should be restricted to the minimum necessary to obtain adequate diagnostic information. As the Doppler ultrasound involves using much higher power intensities, its use should be further restricted for the assessment of the 'at-risk' fetus. as well Doppler is avoided in first trimester. Where ever possible the principle of ALARA (as low as reasonably achievable) should be practiced.

ULTRASOUND IN OBSTETRICS:

It is aptly said that ultrasound acts as the third eye to the obstetrician. The use of clinical ultrasound has revolutionized the practice of obstetrics. As of today, no biologically adverse effects of ultrasound are known and sonography has become the most versatile diagnostic modality used in obstetrics.

Who can perform an obstetric ultrasound?

Should be performed by professionals who have been trained to recognize medically important conditions such as fetal anomalies, artifacts that may mimic pathology, and techniques to avoid ultrasound exposure beyond what is considered safe for the fetus.[13]

Accordingly, the post resident physician who completed residency programs in either radiology or obstetrics and gynecology should possess a minimum of 3 months' experience in obstetric and gynecologic ultrasound evaluation.

In addition, it was recommended that this training include 1 month of supervised and documented training in an established ultrasound facility. Such training should include basic physics, technique, performance, and interpretation.

In addition, the physician should obtain 2 months of practical experience (at least 200 examinations) before offering services as a physician competent in diagnostic ultrasound examination.

Consent before ultrasound examination

Even though a formal written informed consent is not always necessary, the patients should be informed of what to expect about the obstetrics ultrasound, as well as its risks and benefits.

The patient should be educated that ultrasound is only a screening tool, can vary in the detection rate of fetal anomalies, and that all ultrasound diagnosis, can put both mother and fetus at risk.

Types of obstetric ultrasound examination

- First trimester ultrasound examination
- Standard second and third trimester examination
- Limited ultrasound examination
- Specialized/detailed/targeted ultrasound examination

FIRST TRIMESTER ULTRASOUND EXAMINATION:

Indications for performing ultrasound in first trimester are[13]

- Confirm an intrauterine pregnancy
- Evaluate a suspected ectopic pregnancy
- Define the cause of vaginal bleeding
- Evaluate pelvic pain
- Estimate gestational age
- Diagnose or evaluate multi-fetal gestation
- Confirm cardiac activity and identify non-viable pregnancy
- Assist chorionic villous sampling, embryo transfer, and localization and removal of intrauterine devices.
- Asses for certain fetal anomalies, such as anencephaly in high risk patients
- Evaluate maternal pelvic masses and/or uterine abnormalities
- Measure nuchal translucency
- Evaluate suspected gestational trophoblastic disease.

Early pregnancy can be evaluated using Transabdominal or Transvaginal ultrasound, or both. Essential components of first trimester ultrasound includes[13]

- Gestational sac location
- Embryo and/or yolk sac identification
- Crown-rump length
- Cardiac activity
- Fetal number, including amnionicity and chorionicity

- Assessment of embryonic/fetal anatomy appropriate for first trimester
- Evaluation of uterus, adnexa, and cul-de-sac
- Assessment of fetal nuchal region if possible

STANDARD SECOND AND THIRD TRIMESTER EXAMINATION

Indications for performing ultrasound in second and third trimester are[13]

- Estimation of gestational age
- Evaluation of fetal growth
- Evaluate pelvic pain
- Vaginal bleeding
- Cervical insufficiency
- Determination of fetal presentation
- Suspected multi-fetal gestation
- Adjuvant to amniocentesis or other procedures
- Significant uterine size/clinical date discrepancy
- Pelvic mass
- Suspected molar pregnancy
- Adjuvant to cervical encerclage
- Suspected ectopic pregnancy suspected fetal death
- Suspected uterine abnormality

- Evaluation of fetal well- being
- Suspected hydramnios/oligohydramnios
- Suspected placental abruption
- Adjuvant to external cephalic version
- Preterm premature ruptured membranes/ preterm labour
- Abnormal biochemical markers
- Follow-up evaluation of fetal anomaly
- Follow-up evaluation of placental location for suspected placenta praevia
- History of congenital anomaly in previous pregnancy
- Evaluation of fetal condition in late registrants for prenatal care
- Findings that may increase the risk for aneuploidy
- Screening for fetal anomalies

Essential components of second and third trimester ultrasound examination include

- Fetal number; multi-fetal gestations, amnionicity, chorionicity, fetal sizes and fetal genitalia if visualized
- Presentation
- Fetal cardiac activity
- Placental location and its relationship to the internal cervical os
- Amniotic fluid volume

- Gestational age
- Fetal weight
- Evaluation of uterus, adnexa, and cervix
- Fetal anatomical survey, including documentation of technical limitations.[13]

Minimal elements of a standard examination of fetal anatomy:

Head, face and neck

- Cerebellum
- Choroid plexus
- Cisterna magna
- Lateral cerebra ventricles
- Midline falx
- Cavum septum pellucidum
- Upper lip
- Consideration of nuchal fold measurement

Chest

- Four chamber view of heart
- Evaluation of both outflow tracts if technically feasible

Abdomen

- Stomach- presence, size and situs
- Kidney
- Bladder
- Umbilical cord insertion into fetal abdomen
- Umbilical cord vessel number

Spine

- Cervical, lumbar, thoracic and sacral spine

Extremities

- Legs and arms-presence or absence

Gender

- Indicated in low risk pregnancies only for evaluation of multi fetal gestation

LIMITED ULTRASOUND EXAMINATION:

Limited ultrasound examination is performed when a specific question requires investigation. Examples include amniotic fluid assessment, placental location, or evaluation of fetal presentation or viability.

It is appropriate generally only if a prior complete standard ultrasound examination has been done.

SPECIALISED/ TARGETED ULTRASOUND EXAMINATION:

It is a detailed anatomic survey performed when an anomaly is suspected on the basis of history, maternal serum screening test abnormality or abnormal findings from a standard examination.

GENETIC ULTRASOUND:

Performed with the aim of detecting anomalies, markers associated with fetal aneuploidy.

3- AND 4- DIMENSIONAL SONOGRAPHY:

Special transducers are used to obtain volumes as still images-3D and as a function of time—4D.For selected anomalies, such as those of the face and skeleton, 3D may provide additional useful information. Potential advantage of 3-D volume acquisition is the ability to reformat images in any plane. This is particularly useful in evaluation of intracranial anatomy in sagittal plane- for example, the corpus callosum, evaluation of palate and skeletal system.

Recently, 4D imaging e.g. STIC (spatiotemporal image correlation) has been used to improve visualization of cardiac anatomy.

Limitations of 3D and 4D ultrasound are it takes more time and also cannot be used in oligohydramnios, as crowding of adjacent structures obscures the captured image.

GESTATIONAL AGE ASSESMENT

Gestational age which seem to imply the actual age of the fetus from conception to the present, most often used synonymous with menstrual age refers to the length of time calculated from the first day of the last normal menstrual period to the point at which the pregnancy is being assessed.

Accurate estimation of gestational age is important to good obstetric care and is important in a number of situations. For example

- Fetal growth assessment depends on correct estimation of gestational age. Fetal growth abnormalities namely IUGR or macrosomia can be missed or over diagnosed if gestational age estimation was incorrect.
- To interpret certain prenatal tests gestational age is important example serum markers assessment of fetal aneuploidy, interpretation of test titers in Rh negative pregnancy.
- Interpretation of antenatal biophysical testing (non-stress tests and biophysical profiles) as results of biophysical testing depends on

gestational age of fetus. The fetal neuronal systems controlling heart rate and breathing develops well only in early third trimester i.e. around 28 weeks and developed fully by 32 weeks. Hence what is abnormal at 32 weeks can still be normal at 28 weeks.

- Decision regarding timing of delivery is dependent on the gestational age. Preterm labor or postdate pregnancies can be accurately diagnosed only with the knowledge of correct gestational age. Likewise, for appropriate timing of elective caesarean delivery accurate gestational age assessment is must.[14, 15]

METHODS OF GESTATIONAL AGE ASSESSMENT

- Neonatal evaluation
- Clinical dating
- Ultrasound dating

NEONATAL EVALUATION

Neonatal evaluation is accepted to be the best method in determination of gestational age. Unfortunately, neonatal evaluation is not useful to the obstetrician, and there are data which states that "overestimation of gestational age in very preterm babies and underestimation of gestational age in post-term pregnancies occur frequently when the neonate is evaluated by Ballard's method as compared with early ultrasound examination."[16]in spite of these

deficiencies neonatal evaluation of gestational age is the “gold standard” to determine the accuracy of any other method.

CLINICAL DATING

Clinical dating has very limited value. Clinical dating can be based on

I. PATIENTS HISTORY
II. CLINICAL EXAMINATION

I. PATIENTS HISTORY

Date of Fruitful Coitus**:**

If the patient can remember the date of single fruitful coitus with certainty, it is quite reliable to predict the expected date of delivery with accuracy of 50% within 7 days on either side. Expected date of delivery can be calculated by adding 266 days to the date of single fruitful coitus. However this is not of much practical value.

Last Menstrual Period:

Provided the periods are regular, it is very useful. It is the most commonly used method. Last menstrual period +280 days will give the expected day of delivery (Nagele’s rule).Its prediction range is about 50% with 7 days on either side of expected day of delivery. If the interval of cycles is

longer, the extra days are to be added and if the interval is shorter, the lesser days are to be subtracted to get the expected day of delivery. In significant no of cases (20-30%), the patient either fail to remember the LMP or report inaccurately.[17, 18]

In a study by Kramer et al, in 1988 it was shown that LMP estimates were particularly inaccurate in patients with preterm and post term pregnancies.[19]

Date of Quickening:

A rough idea about the probable date of delivery can be deduced by adding 22 weeks in primi and 24 days in multi-para to the date of quickening.

II. CLINICAL EXAMINATION

Uterine Size:

Uterine size prior to 12 weeks more precisely corresponds with the period of amenorrhea. Has limited clinical value .Many factors make the assessment of uterine size unreliable namely maternal obesity, observer experience, position of uterus, amount of amniotic fluid, multiple gestation, uterine fibroid, fetal growth disorders. Studies have shown that clinician's measurement tend to underestimate the gestational age and have a preference foe even numbers.[20]

Fetal Heart Rate:

Fetal heart rate can be picked up at the earliest by 18-20 weeks using ordinary stethoscope and that using Doppler at 10 weeks.

ULTRASOUND DATING

Fetal biometry can accurately determine the gestational age of the fetus and the adequacy of the fetal growth. The most commonly used parameters are crown rump length(CRL) in the first trimester and the biparietal diameter(BPD),femur length(FL),head circumference (HC),humerus length (HL), and abdominal circumference (AC) in the second trimester.

CROWN RUMP LENGTH (CRL):

Crown rump length measurement in the first trimester seems to be the most accurate method of dating. Other methods of dating, such as gestational sac diameter or yolk sac diameter are less accurate than CRL.[21]

Method of CRL measurement

To measure CRL longitudinal section of the uterus and gestation sac is obtained. Slide (if scanning abdominally) or pan (if scanning transvaginally) the probes slowly to each side until pulsations from the fetal heart can be seen. Slowly rotate the probe, keeping these pulsations in view, until the long axis of

the fetus is obtained. Freeze this image. Measurements are taken from the top of the head (crown) to the end of the trunk (rump) using the onscreen calipers.

Figure 1-*The longitudinal axis of the fetus using the Transabdominal method. The calipers demonstrate measurement of the crown–rump length.*

The ability correctly to establish gestational age by this method depends solely on the operator obtaining a true, unflexed, longitudinal section of the embryo or fetus, with the end-points of the crown and rump clearly defined, and then placing the callipers correctly on these defined end-points.

CRL measurements are more accurate when the embryo is visualized with high frequency vaginal ultrasound.[22]

Accuracy of gestational age assessment

- Between 7 and 10 weeks: ±3 days
- Between 10 and 14 weeks: ± 5 days.

However between 5 and 7 weeks CRL measurement is inaccurate because firstly, the full length of embryo is not formed. Secondly, the end points cannot be clearly distinguished from adjacent yolk sac/ gestational sac.

An optimal CRL image, accurately measured, is thus more accurate than the Biparietal diameter in dating a pregnancy.[23]

BIPARIETAL DIAMETER

The first ultrasonic method of gestational dating was the measurement of the fetal BPD. Biparietal diameter is the most accurate measurement to determine gestational age in second trimester.BPD will predict the gestational age to within ± 5 days. It has the easiest reproducible landmarks. Most studies have shown a linear quadratic or linear-cubic relationship between gestational age and BPD.

Method of BPD measurement:

The BPD is the maximum diameter of a transverse section of the fetal skull at the level of the parietal eminences. The BPD, occipitofrontal diameter (OFD)

and head circumference can be measured from one of the following two sections:

1. Lateral ventricles view
2. Thalami view

***1. LATERAL VENTRICLES VIEW*:**

Lateral ventricles view should include the following features:

- A rugby-football-shaped skull, rounded at the back (occiput) and more pointed at the front (synciput)
- A long midline equidistant from the proximal and distal skull echoes
- The cavum septum pellucidum bissecting the midline one-third of the distance from the synciput to the occiput
- The two anterior horns of the lateral ventricles, symmetrically placed about the midline
- All or part of the posterior horns of the lateral ventricles symmetrically placed about the midline.

  In earlier gestations (15–20 weeks), the optimal view of the posterior horn is usually obtained in this section (see below). At later gestations (20–24 weeks), the optimal section for visualizing the posterior horn is slightly lower than the BPD section.

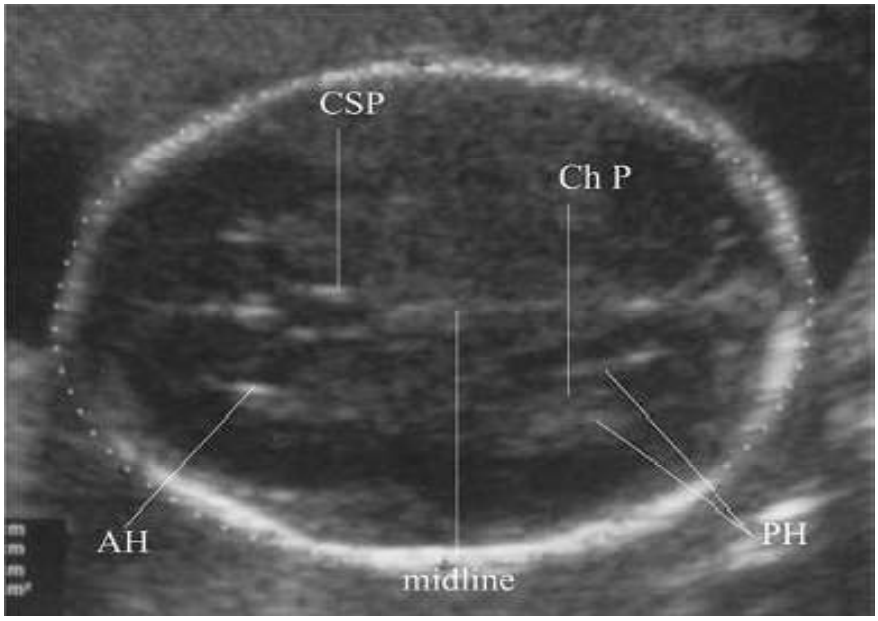


Figure 2 *Plane of BPD*

Transverse section of the fetal head demonstrating the landmarks required to measure the BPD using the lateral ventricles view. Note the rugby football shape, the centrally placed midline, the presence and position of the Cavum septum pellucidum (CSP), and the appearance and position of the anterior horns (AH) of the lateral ventricles. Note the choroid plexus (ChP) within the distal posterior horn (PH) of the lateral ventricle and reverberation causing poor visualization of the proximal posterior horn.

Measuring the BPD from the lateral ventricles view

Obtain a longitudinal section of the fetus. Small sliding movements of the transducer on each side of the fetal spine will give a longitudinal section of the

fetal head that will demonstrate a strong midline echo as shown in Figure. By rotating the transducer through 90° a transverse section of the fetal head is obtained. If the midline is not in the exact middle of the section, alter the angle of the probe slightly on the maternal abdomen. This corrects for the angle of asynclitism. Once the midline is centrally placed do not alter the angle of the probe. Now assess the shape of the fetal skull. The required shape is that of a rugby football, with the more pointed end at the synciput. As the Cavum lies one-third of the distance from the synciput to the occiput, identifying the Cavum will allow you to determine which are the front and the back of the head. If the section is not the required ovoid shape, make minor rotational adjustments. If the landmark features listed above are not evident when the midline and shape are correctly imaged then the level of the section is wrong and should be corrected by small sliding movements of the probe up or down the fetal head. The BPD is then measured on the frozen image.

Outer to outer technique:

Place the intersection of the two arms of the first onscreen caliper on the outer aspect of the proximal skull surface. Place the intersection of the two arms of the second caliper on the outer aspect of the distal skull surface at right angles to the midline and at the widest diameter .This BPD measurement includes the thickness of both parietal bones and is commonly described as an ‘outer to outer’ measurement.

Figure 3 - *longitudinal section of the fetal head and spine demonstrating the midline echo. Rotating the transducer through 90° should produce the sections demonstrated in Fig 2.*

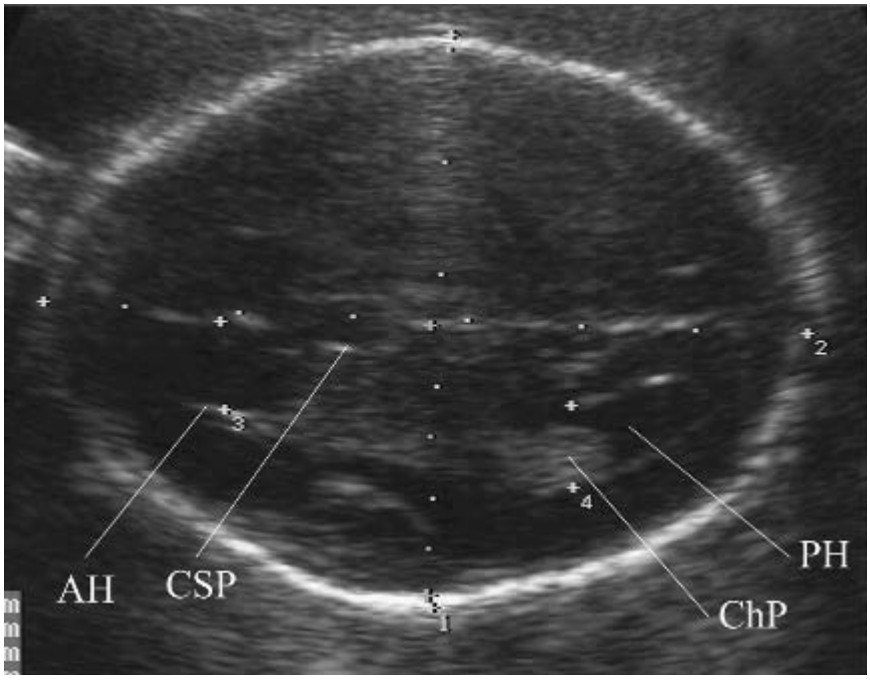


Figure 4 - *lateral ventricle view*.

Fig 4 -*Transverse section of the fetal head with the callipers placed on the outer border of both the proximal and distal parietal bones (diameter 1). The measurement therefore produces an 'outer to outer' BPD measurement*.

Outer to inner technique:

The thickness of only one (the upper) parietal bone is included when measuring the BPD. The two techniques will produce BPD measurements that differ typically by 2–3 mm in the second trimester, approximately equivalent to 1 week of gestation There is no consensus regarding which technique is more acceptable, although the 'outer to inner' method finds greater favor with the physicists. This is because the anterior edge of the parietal echo is less influenced by the equipment's controls than the posterior edge. The 'outer to inner' measurement is thus a more accurate representation of the true distance selected for measurement than the 'outer to outer'.

***2. THALAMI VIEW*:** should include the following features

- A rugby-football-shaped skull, rounded at the back (occiput) and more pointed at the front (synciput).
- A short midline equidistant from the proximal and distal skull echoes.
- The cavum septum pellucidum bisecting the midline one-third of the distance from the synciput to the occiput.

- The thalami
- The basal cisterns.

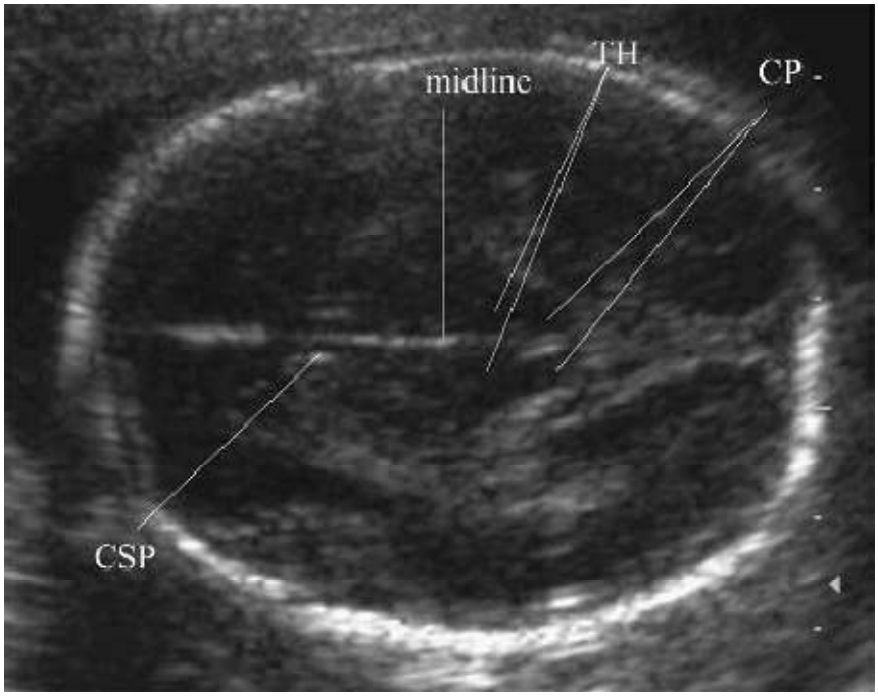


Figure 5 - *Thalamic view*

Transverse section of the fetal head demonstrating the landmarks required to measure the BPD using the thalami view

CP - Cerebral peduncles,

CSP - Cavum septum pellucidum,

TH - Thalami.

Measuring the BPD from the thalami view

Follow the same procedure as outlined above. From the anterior horns section, make a *very* slight rotation of the probe toward the fetal neck (i.e. the back of the head) to image the basal cisterns in preference to the posterior horns of the lateral ventricles. This is followed by a *very* slight sliding movement of the probe downward, toward the fetal body so that the lower border of the Cavum is just visible together with the optimal view of the thalami. The BPD is measured using the technique described above.

Generally, thalamic view is most commonly used. BPD and HC measurement obtained from both views are comparable.

MEASURING THE HEAD CIRCUMFERENCE (HC)

This is measured from the same view as that used for the BPD.

The HC is calculated by one of three basic methods:

THE TWO-DIAMETER METHOD:

The BPD and OFD are both measured using the outer to outer technique (Fig.6). The machine's software then calculates the HC using the formula πd derived from the formula for the circumference of a circle ($2\pi r$)

HC = 3.14 (BPD + OFD)/2

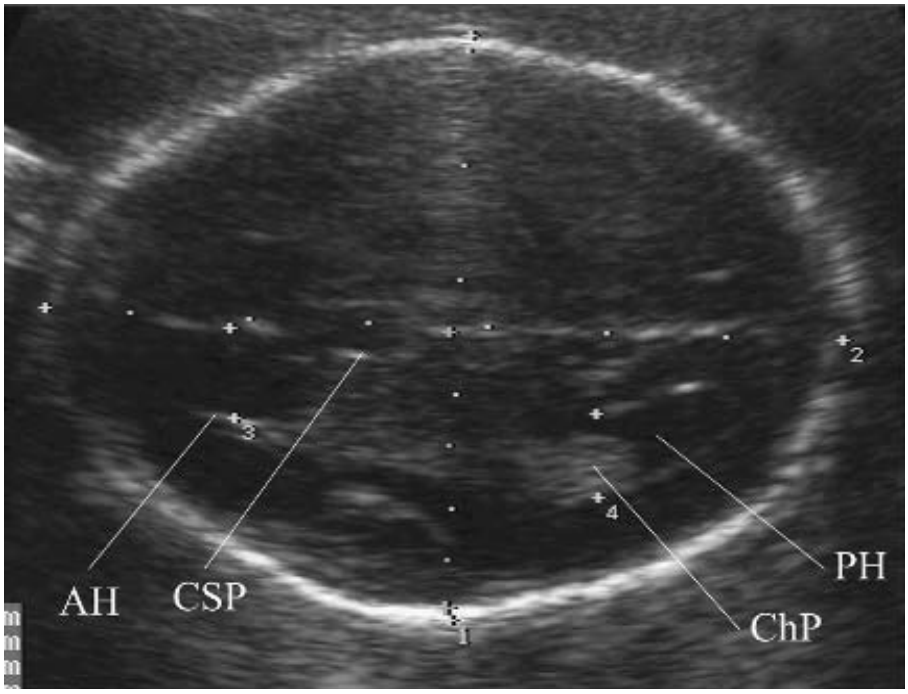


Figure 6 - *Measurement of the head circumference using the two diameter method (lateral ventricles view). The calipers are placed on the outer edge of both parietal bones to obtain the BPD and on the outer edge of the occipital and frontal bones to obtain the OFD. Both the BPD and OFD are therefore obtained using the 'Outer to outer' technique*

***THE ELLIPSE METHOD*:**

The first onscreen cursor is placed on the outer table of the skull at the occiput. The second cursor is then placed on the outer table of the skull at the synciput. Using the appropriate control, a ready-formed ellipse of dots is moved out from between the two cursors until it matches the outline of the fetal skull.

On many machines, adjustment of the position of one or both the cursors can be made after the ellipse is formed to achieve a more exact match.

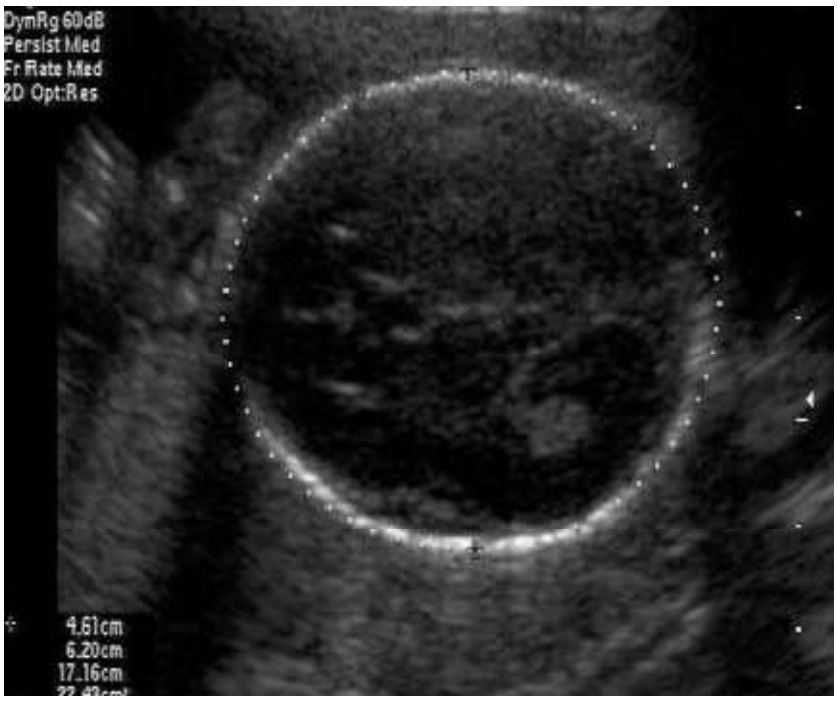


Figure 7- *Measurement of head circumference using the ellipse method (lateral ventricles view).*

THE PLOT METHOD:

The onscreen cursor marker is placed on the outer table of the skull. The correct position is then recorded in the machine's software by pressing the caliper 'enter' control. Sequential marks are plotted and recorded around the whole circumference. In some equipment, a continuous trace is produced rather than a series of dots. On many machines, adjustment of the last position(s) of the cursor can be made in case of error.

ABDOMINAL CIRCUMFERENCE (AC)

The AC is a less reliable parameter when used to determine gestational age because it is very sensitive to alterations in fetal growth. For the same reason the AC is the most important parameter in estimation of fetal weight.

Growth of fetal Abdominal Circumference is linear from 15 weeks onwards. Mean rate of AC growth is ~14.7mm / 14 days.[7]

The section on which the AC is measured should feature

- A circular section of the abdomen demonstrating an unbroken and short rib echo of equal size on each side.
- A cross-section of *one* vertebra visualized as a triangle of three white spots.
- A short length of umbilical vein. This should be imaged so that it is centrally placed between the lateral abdominal walls and is a third of the way along an imaginary line drawn from the anterior abdominal wall to the fetal spine.
- The stomach, usually visualized as a hypo echoic area in the left side of the abdomen.

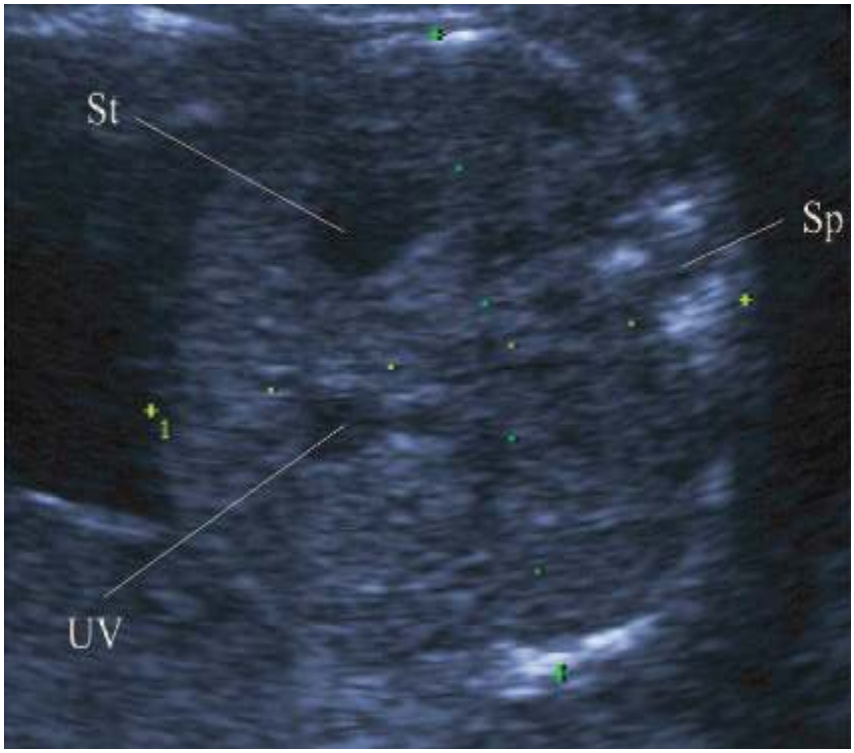


Figure 8 -*Transverse section of the fetal abdomen demonstrating the landmarks required to measure the AC. Note the appearance of the normal single vertebra (Sp), the short length of umbilical vein (UV) and its position. Note also the appearance and position of the normally sized stomach (St).*

Method:

Obtain a longitudinal view of the fetus that demonstrates both the fetal heart and the fetal bladder. Slide the transducer laterally until the fetal spine is visualized. Rotate the transducer through 90° at the level of the fetal stomach to obtain a cross-section. The outline should be circular, if it is ovoid make a small adjustment of the rotation or the angle of the transducer. If the umbilical vein is not visualized as described above, make small sliding movements of the

transducer to change the level of the section. Freeze the image. The circumference of the abdomen is measured in the same way as the head circumference, using the two-diameter method. The antero posterior diameter (APAD) is measured from the fetal spine to the anterior abdominal wall. The short section of umbilical vein should lie along this axis. The transverse abdominal diameter (TAD) is measured across the widest part of the abdominal circumference section at 90° to the APAD. Both diameters are measured using the 'outer to outer' technique. The machine's software then calculates the abdominal circumference (AC) using the formula πd derived from the formula for the circumference of a circle (2πr):

AC = 3.14 (TAD + APAD)/2

FEMUR LENGTH (FL)

This measurement is as accurate as the BPD in the prediction of gestational age. It is useful in confirming the gestational age estimated from BPD or HC measurements and can often be obtained when fetal position prevents measurement of the BPD or HC. The femur can be measured from 12 weeks to term.

FL seems to be most accurate single measurement for the estimation of gestational age in late > 28 weeks gestation

Method

Measuring the femur is ideally undertaken after the AC has been measured. Slide the probe caudally from the AC section until the iliac bones are visualized. At this point, a cross-section of one or both femurs is usually seen. The upper femur should be selected for measurement. The lower femur is frequently difficult to image clearly because of acoustic shadowing from fetal structures anterior to it.

Keeping the echo from the anterior femur in view, rotate the probe slowly until the full length of the femur is obtained. You might need to make a *small* sliding movement after each rotational movement to bring the probe back onto the femur. To ensure that you have the full length of the femur and that your section is not oblique, soft tissue should be visible beyond both ends of the femur and the bone should not appear to merge with the skin of the thigh at any point The end-points of the femur are often difficult to define when the femur is imaged lying horizontally but are much easier to define when the bone lies at a slight angle (5–15° to the horizontal). The angle of the bone relative to the horizontal can be manipulated by dipping one end of the probe gently into the maternal abdomen.

The measurement of the femur is made from the center of the 'U' shape at each end of the bone. This represents the length of the metaphysis and excludes the femoral head or the distal epiphysis.

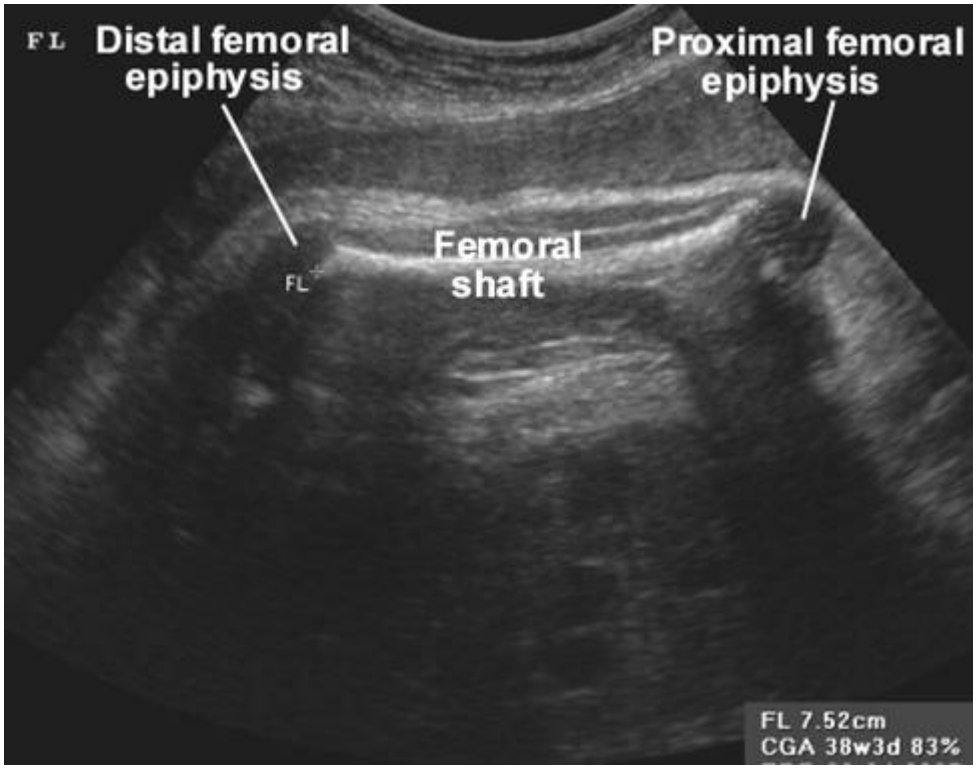


Figure 9 *Measurement of femur length*

TRANSCEREBELLAR DIAMETER (TCD)

In the second trimester, the TCD measurement (in millimeters) is numerically equivalent to the number of weeks of gestation of the pregnancy. It is therefore useful in the assessment of gestational age, especially when there is a discrepancy in gestational age equivalent between the BPD or HC and the femur.

ULTRASOUND APPEARANCE OF FETAL CEREBELLUM WITH ADVANCING GESTATION

The ultrasound change includes both shape and echogenicity. The ultrasound appearance progresses from an ‘eyeglass’ (grade I), to a dumbbell (grade II),and finally to a fan shaped(grade III).The echogenicity of cerebellum changes from hypo echoic (cystic) to slightly echoic with marginal enhancement(ground glass)and to hyper echoic(solid) at term.

These changes reflect the histological development of fetal cerebellum. The development of fetal cerebellum occurs in three stages

- Stage I (12-16 weeks)
- Stage II (16-28 weeks)
- Stage III (>28weeks)

Figure 10 *Grade I cerebellum, cerebellar hemispheres are cystic and show pair of eyeglasses appearance.*

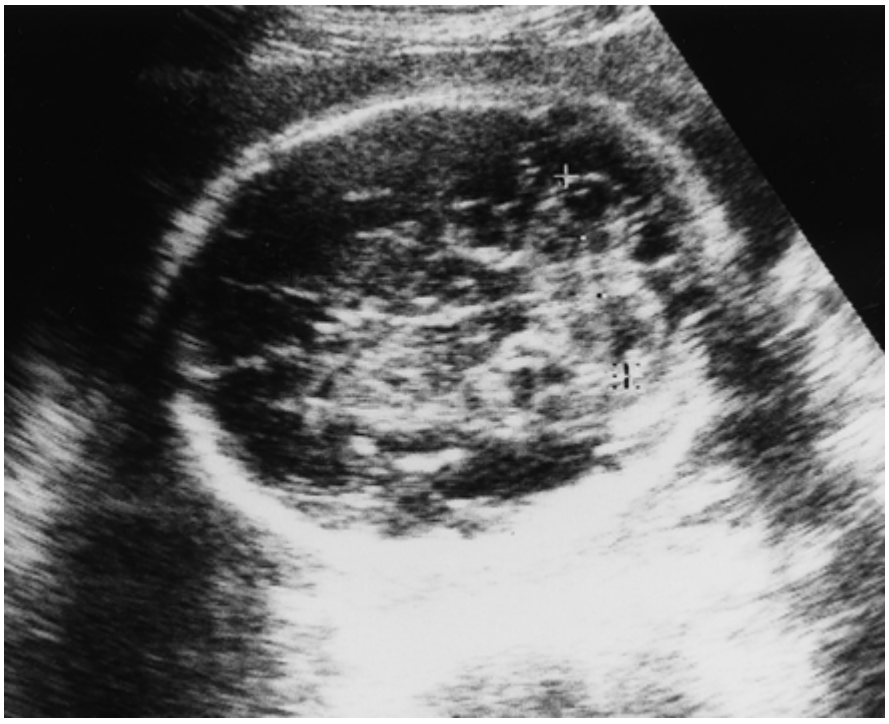


Figure 11 *Grade II cerebellum, cerebellar hemispheres are oval and echogenic, with echogenicity prominent in margins giving dumbbell shaped.*

Figure12 *Grade III cerebellum, cerebellar hemisphere are fan shaped and homogenously echogenic (solid appearance)*

Measuring the transcerebellar Diameter (TCD)

The cerebellum is dumb-bell-shaped and consists of two circular hemispheres separated centrally by the more hyper echoic triangular-shaped vermis.

The section required to measure the TCD is the suboccipitobregmatic view, in which the anterior horns of the lateral ventricles and Cavum are visualized at the front of the head together with the cerebellum at the back. Obtain the lateral ventricle view required for the BPD then rotate the probe slightly downward, toward the fetal neck. The posterior horns of the lateral

ventricles will disappear from view to be replaced by the cerebellum. Ensure you do not rotate the probe too far toward the neck. Although this might not affect the TCD measurement, it will give a false impression of an enlarged cisterna magna and/or nuchal skin fold thickness. The TCD is measured at 90° to the long axis of the cerebellum across its widest point, using the 'outer to outer' method.

Figure *13 Measurement of transverse cerebellar diameter*

Between 14 and 24 weeks of gestation transverse diameter of cerebellar hemispheres in mm is a close approximation of gestational age in weeks.[10]

Transverse cerebellar diameter is one of the few soft tissue measurements that correlate well with gestational age in IUGR.[25]

Cerebellum is relatively spared the effects of mild to moderate uteroplacental dysfunction. Whether its measurement offers an advantage over bony measurements in the assessment of compromised fetal growth is controversial.[26]

Other parameters which can be used to determine fetal gestational age are Length of Tibia, Radius, Ulna, Clavicle, Foot and Binocular diameter.

MATERIALS AND METHODS

Study design

Randomised prospective study of 350 normal singleton pregnancies admitted to the Department of Obstetrics and Gynecology, Government Kilpauk Medical College, Chennai

Study Period

12 months from November 2012 to November 2013.

Selection of participants

Inclusion criteria:

- Normal singleton pregnancies of 15- 40 weeks of gestation with known LMP.
- LMP confirmed by dating scan.

Exclusion criteria:

- Multiple pregnancy
- Congenital malformations

- 1st Trimester pregnancy
- Doubtful LMP
- Previous irregular cycles.
- Any medical or obstetrical complicating pregnancy
- Clinically suspected IUGR

Sample size:

- Population size(for finite population correction factor or fpc)(*N*) 3000
- Hypothesized % frequency of outcome factor in the population (*p*): 50%+/-5
- Confidence limits as % of 100(absolute +/- %)(*d*): 5%
- Design effect (for cluster surveys-*DEFF*):
- Equation for Sample size $\boldsymbol{n = [DEFF*N\ p(1-p)]/\ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]}$
- For a confidence limit of 95% the sample size is 341, hence the sample size was selected as 350.

Method of collection of data

Pregnant women of gestational age 15-40 weeks as assessed by clinical and other conventional USG parameters attending the Antenatal OPD and IP patients of Department of Obstetrics and Gynaecology, Government Kilpauk Medical College, Chennai from November 2012 to November 2013.

Detailed history, clinical examination and investigations were recorded for each patient at the time of initial visit

Gestational age determination was based on the best estimate from a reliable menstrual history and confirmed by a fetal dating scan done early in the first trimester.

All patients meeting the inclusion criteria for the study were briefed about the study and consent taken for recruitment as part of the study

A detailed anomaly scan was also carried out at 18 to 20 weeks period of gestation to rule out any obvious congenital anomalies.

Ultrasound estimation of fetal parameters like BPD, FL, AC and TCD were obtained.

Instrumentation:

All examination was performed using Mindray and GE LOGIC scanner with 3.5 MHz transducer.

Technique of scanning

Scanning for Biparietal Diameter

Measurement of Biparietal diameter (Figure-14): BPD is measured at the level of paired thalami and cavum septi pellucidi, from the outer edge of the cranium nearest the transducer to the inner edge of the cranium farthest from the transducer.

Figure-14 *Measurement of Biparietal diameter*

Scanning for Femur Length

Once the femur was located (Figure15), an attempt was made to define both ends of the calcified portion of femur. The entire length of ossified diaphysis of femur is measured. The thin bright reflection of the cartilaginous epiphysis should not be included in the measurement.

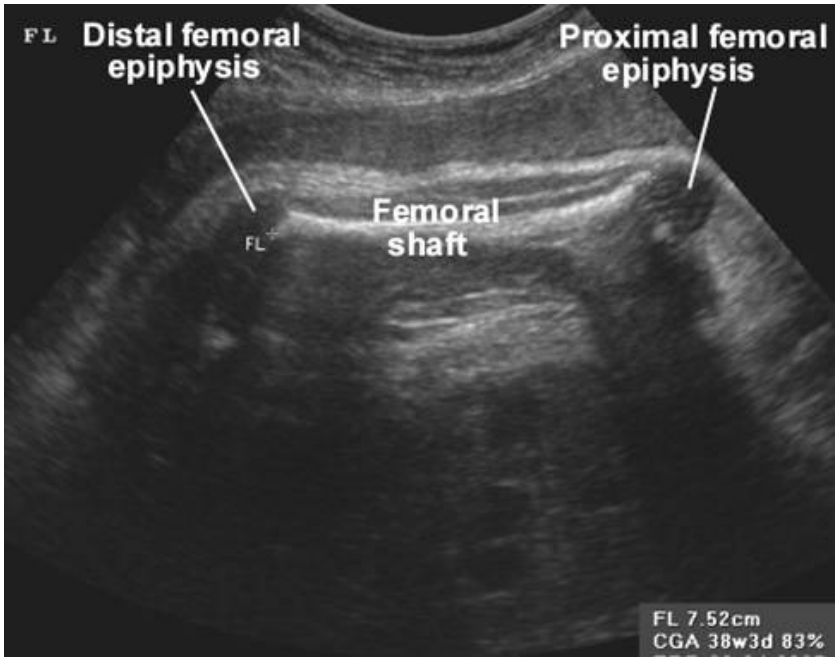


Figure 15 *Measurement of femur length*.

Scanning for abdominal circumference

Abdominal circumference was measured with the transducer in trans-axial scan at the level of liver which included the intra hepatic umbilical portion of the left portal vein and stomach bubble and measurement were taken along the outer edge of the abdomen (Figure:16).

Figure: 16*, Measurement of Abdominal circumference*

Scanning for Transcerebellar Diameter

For measuring TCD the technique described by McLeary et al (1984) and Goldstein et al (1987) was followed, in which the usual thalamic plane used for BPD is obtained, the transducer is then rotated about 30° below the thalamic plane to see the cerebellum.ie caudal rotation of transducer keeping the frontal end fixed.[28, 29] (figure 17) TCD measured from outer to outer margins of cerebellum.

Figure 17-*Measurement of transcerebellar diameter*.

Only single TCD measurement was used in each patient who had multiple measurements at different gestational ages.

The BPD, FL, TCD, AC were all tabulated and compared with standard charts.

A standard profoma was compiled for each patient documenting the above mentioned parameters

Statistical analysis:

Statistical analysis was done using SPSS software Version 17. Concordance between the actual gestational age by LMP and the predicted TCD

were based on calculating the Pearson's (linear) correlation coefficient. By using linear analysis, regression equation was developed

From the collected data the mean, standard deviation was calculated and regression equation was developed.

A cross sectional nomogram was constructed from the measured TCD values and the same was compared with previous available nomograms.

OBSERVATION AND RESULTS

This study was conducted over 12 months in a tertiary care centre with the principle aim of estimating fetal gestational age by TCD in singleton pregnancy and comparing it with conventional parameters. The study population consisted of 350 subjects between 18-35 years. Majority of the cases were between 21 and 27 years, comprising 46.3% of the total number of cases included in the study.

Table 1- Age distribution of the study population

Age group	Frequency	Percent
< 19 yrs	23	6.6
19 - 21 yrs	58	16.6
22 - 24 yrs	78	22.3
25 - 27 yrs	84	24.0
28 - 30 yrs	61	17.4
above 30 yrs	46	13.1
Total	350	100.0

The above table depicts that the age group lies between 18 – 35 years with mean 25.16±standard deviation 4.393

FIGURE 18 AGE DISTRIBUTION OF STUDY POPULATION

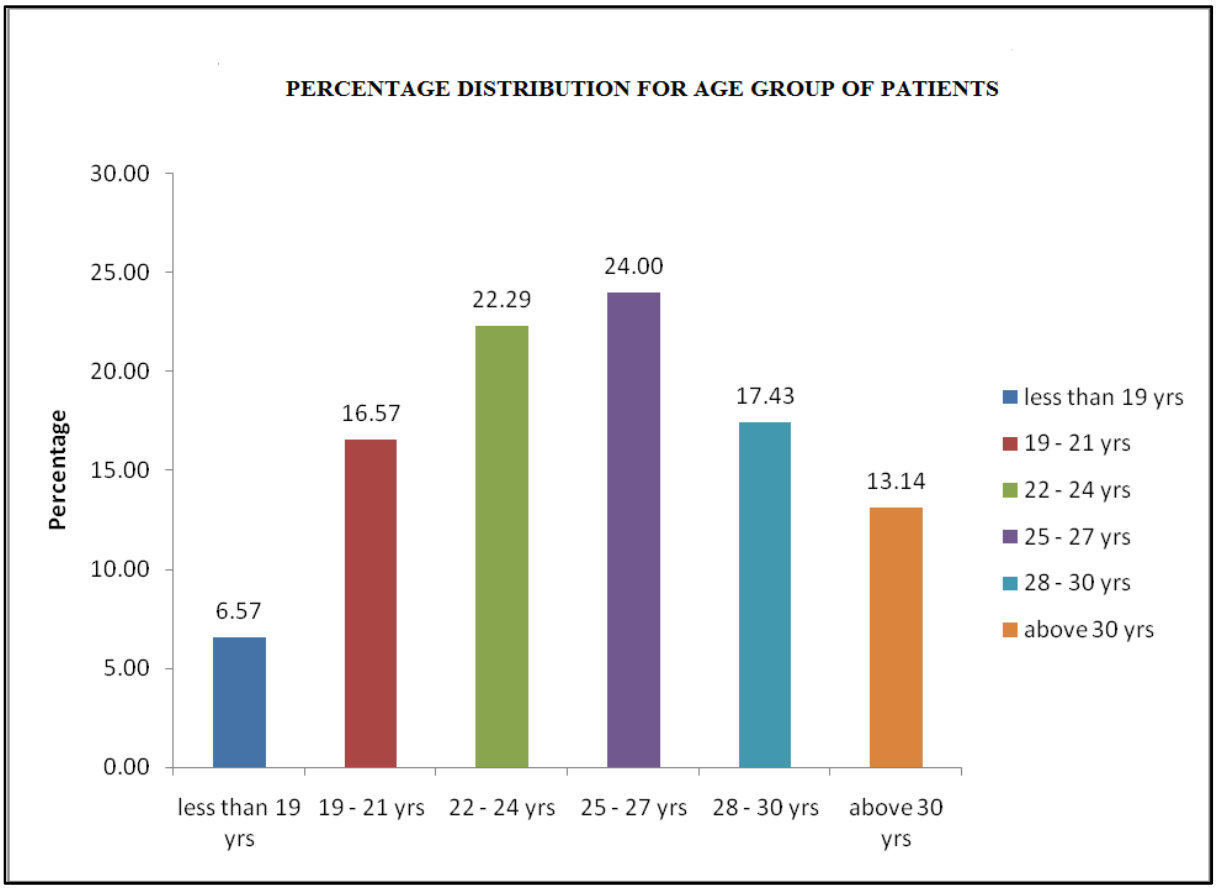
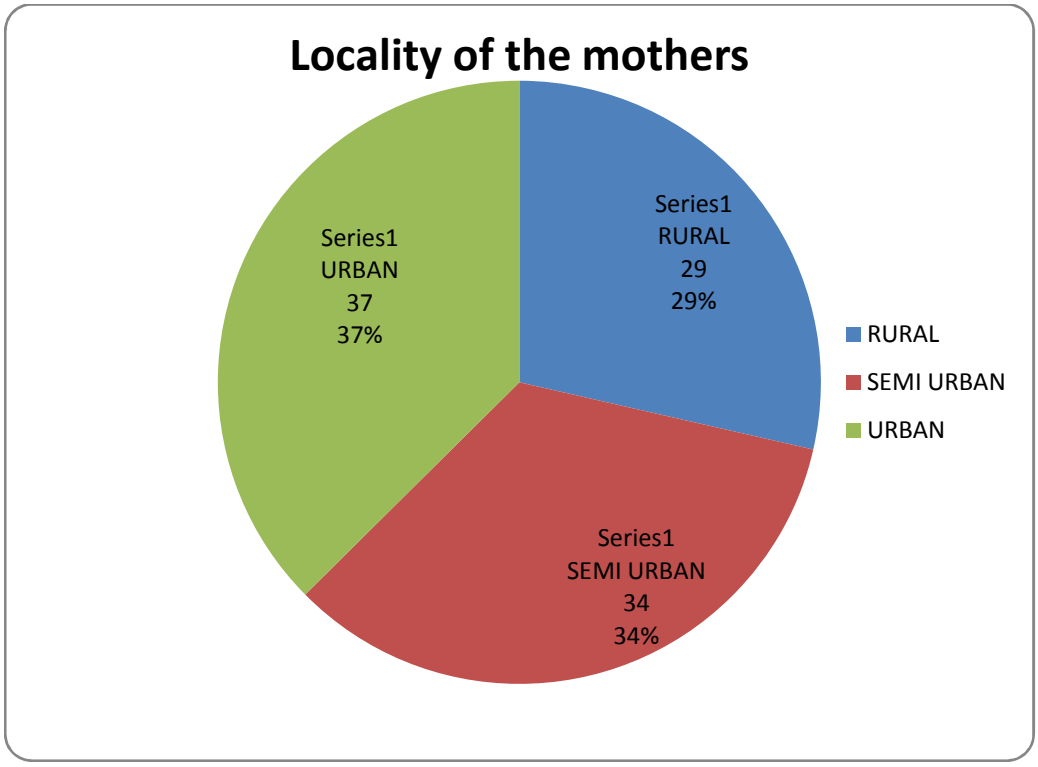


Table 2 Demographic parameters of the study population.

	FREQUENCY	PERCENT
LOCALITY		
RURAL	100	28.6
SEMI URBAN	119	34.0
URBAN	131	37.4
EDUCATION		
LITERATE	257	73.4
ILLITERATE	93	26.6
CHECK UP		
REGULAR	252	72.0
REFERRED	98	28.0

A total of 28.6% of the patients were from rural area, 34% from semi urban and 37.4% were from urban area



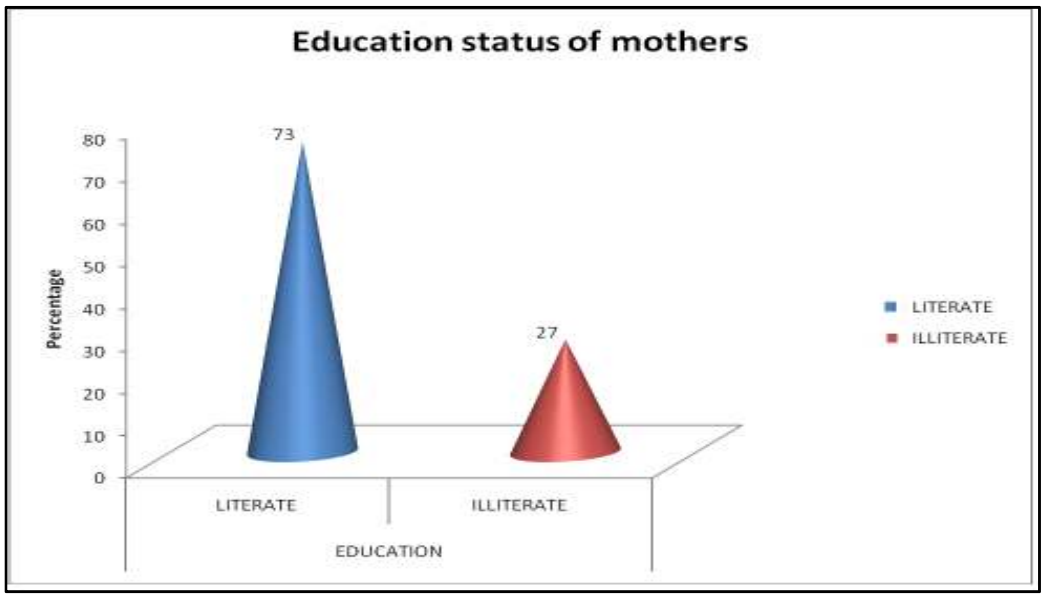


Figure 19 and 20.locality and educational distribution

Of the 350 patients 257(73.45) were literate and 93(26.6%) were illiterate.

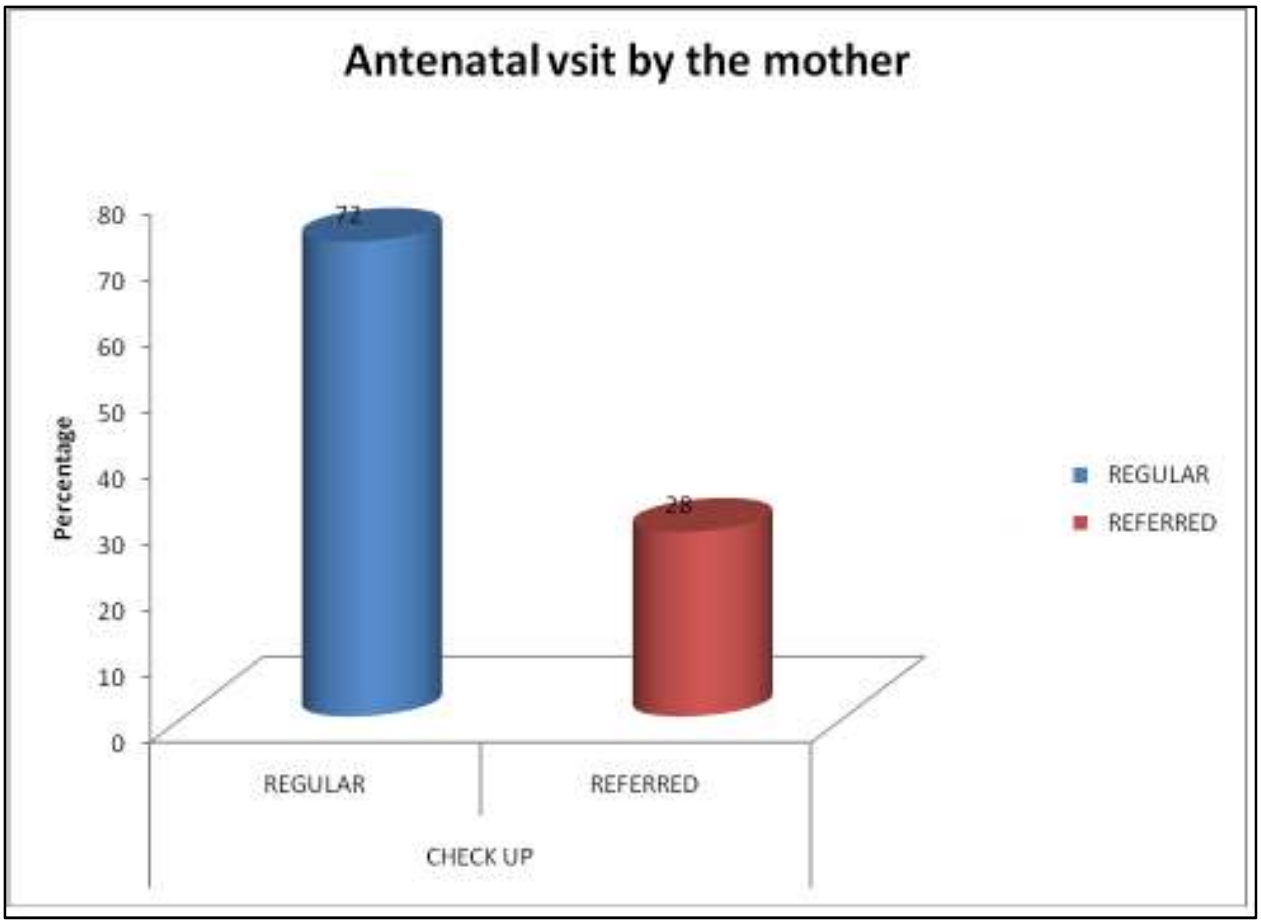


Figure 21 Type of visit

This bar chart shows the type of ante natal visits by the mothers, 72% of the patients were cases seen through Antenatal OPD on regular Antenatal checkup, while 28% were referred cases from other primary centers as seen in labour ward.

DISTRIBUTION OF GESTATIONAL AGE IN WEEKS

As shown from below table of the 350 cases 104 patients were between 14 and 23 weeks of gestation, 124 were between 24 to 32 weeks and 122 patients were more than 32 weeks of gestation

Table 3 Distribution of gestational age in weeks

GESTATIONAL AGE (weeks)	FREQUENCY	PERCENT
14-23 WEEKS	104	29.71
24-32 WEEKS	124	35.43
MORE THAN 32 WEEKS	122	34.86
Total	350	100

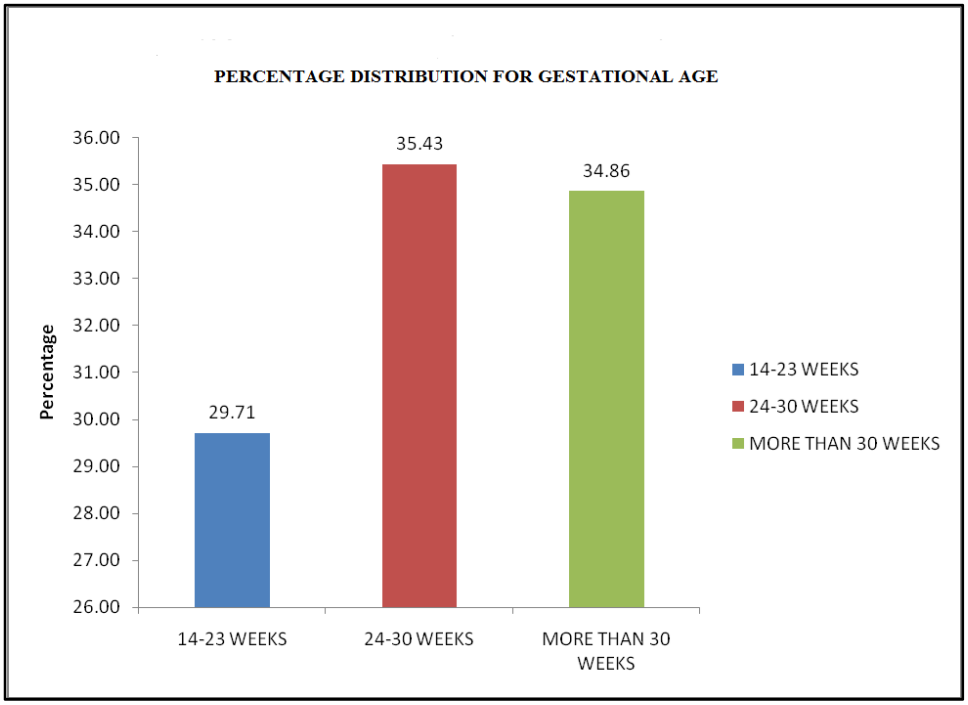


Figure 22.Gestational age distribution

CORRELATION BETWEEN LMP GA AND TCD GA

Scatter diagram for gestational age from LMP and GA predicted by TCD

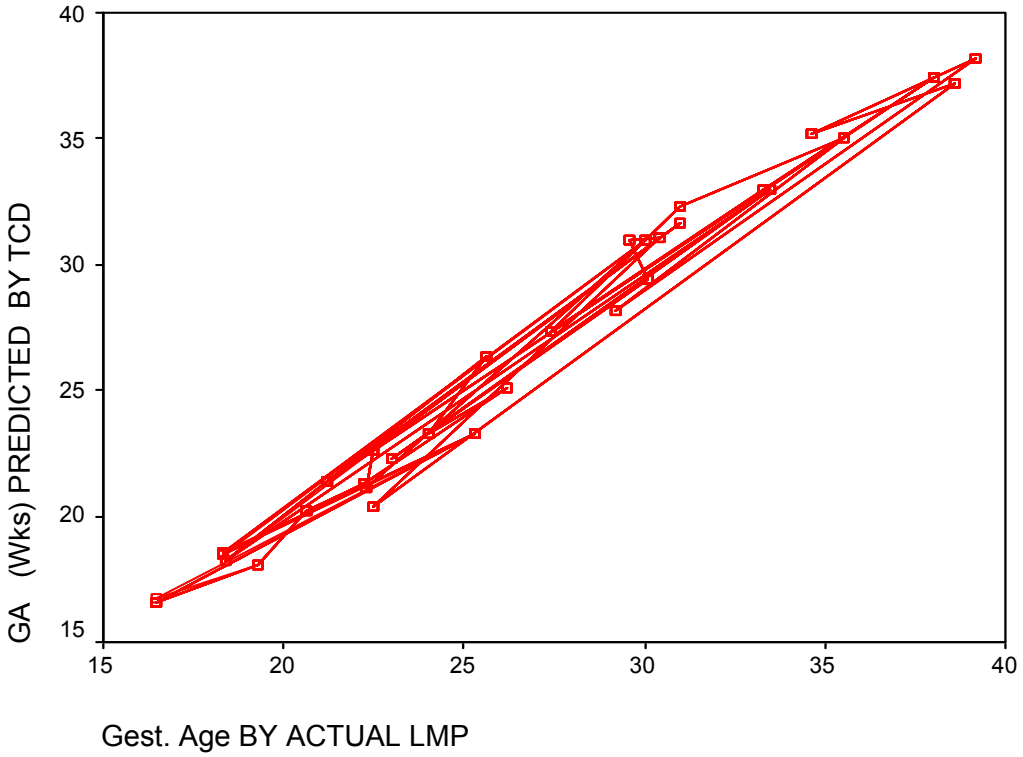


Figure 23 Actual-to-predicted GA based on the TCD nomogram in singleton gestations (Pearson's correlation coefficient 0.99; P < .0001; R^2= 97.9%).

Concordance between GA from LMP and predicted GA from TCD was high (Pearson's correlation coefficient 0.99; P < .0001; R^2= 97.9%). The Pearson's correlation coefficient between LMP gestational age and TCD was 0.99, which is statistically significant (P < .0001).The R^2 =97.9% indicates, 97.9% of TCD can be explained by LMP gestational age.

TABLE 4 Concordances between the Actual and Predicted Gestational Age Based On TCD Measurement.

	GESTATIONAL AGE			
TCD (cm)	**LMP (actual)**	**PREDICTED**	**MEAN DIFFERENCE**	**SD**
16	16.5	16.6	1.00	2
18	18	18.2	2.00	2
20	18.4	18.6	2.00	3
22	20.1	20.4	3.00	2
24	21.5	20.5	7.00	2
26	24.3	24.2	-1.00	3
28	25.3	26.1	8.00	4
30	26.2	27.1	9.00	3
32	27.5	28.2	7.00	3
34	28.2	28.4	2.00	2
36	30.1	30.2	1.00	2
38	31.3	31.6	3.00	4
40	31.5	32	5.00	2
42	32.3	32.5	2.00	1

Between 16 and 23 weeks' gestation, the mean predicted GA ranged within 1 to 3 days of actual GA. between 24 and 32 weeks, the mean predicted GA was within 7 to 9 days, and at 32 weeks or greater, the mean predicted GA was within 7 days of the actual GA as shown in the Table 4.

Using linear regression analysis, a strong association was found between TCD and gestational age

And gestational age can be calculated using the formula:

"**GESTATIONAL WEEKS = 0.567*TCD +8.855"**

For example if TCD =22.5 we can predict the GA by above formula which is equivalent to 21 weeks 3 days

CORRELATION OF LMP GA WITH CONVENTIONAL PARAMETERS AND TCD

TABLE 5 Correlation between LMP GA and Conventional GA.

GA(weeks)	Pearson's correlation	P value	Total No
BPD	.978(**)	.0001	350
FL	.984(**)	.0001	350
AC	.982(**)	.0001	350
TCD	.995(**)	.0001	350

** Correlation is significant at the 0.01 level (2-tailed).

The study showed a statically significant concordance between LMP gestational age and gestational age as given by BPD, FL, AC, and TCD. But TCD and LMP had high significant correlation (0.995*) almost having same days.

CORRELATION OF TCD GA WITH CONVENTIONAL PARAMETERS

GESTATIONAL AGE

BPD PREDICATED GA WEEKS VS TCD PREDICTED GA WEEKS

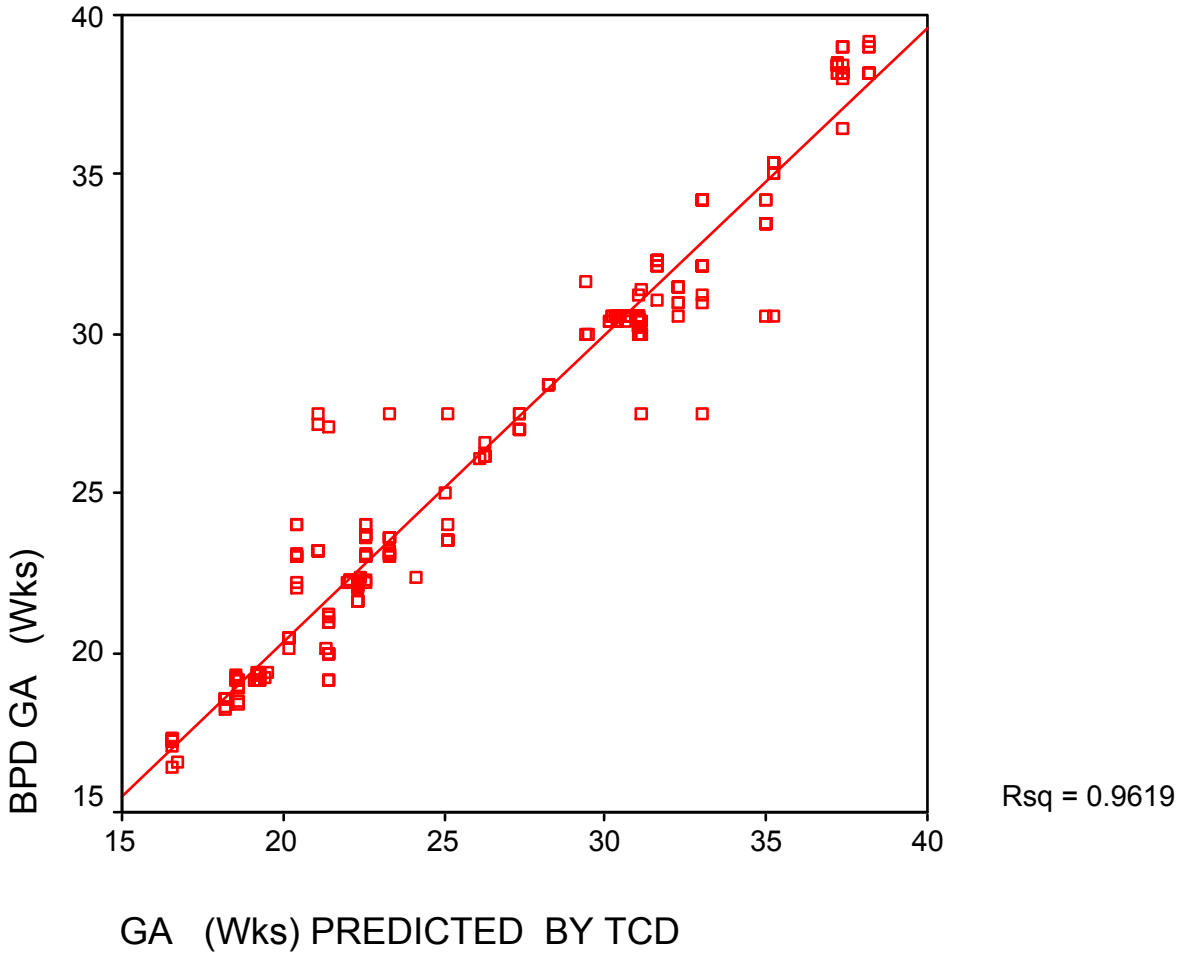


Figure 24

Above graph shows there is strong relationship between BPD and TCD

FL PREDICTED GA WEEKS VS TCD PREDICTED GA WEEKS

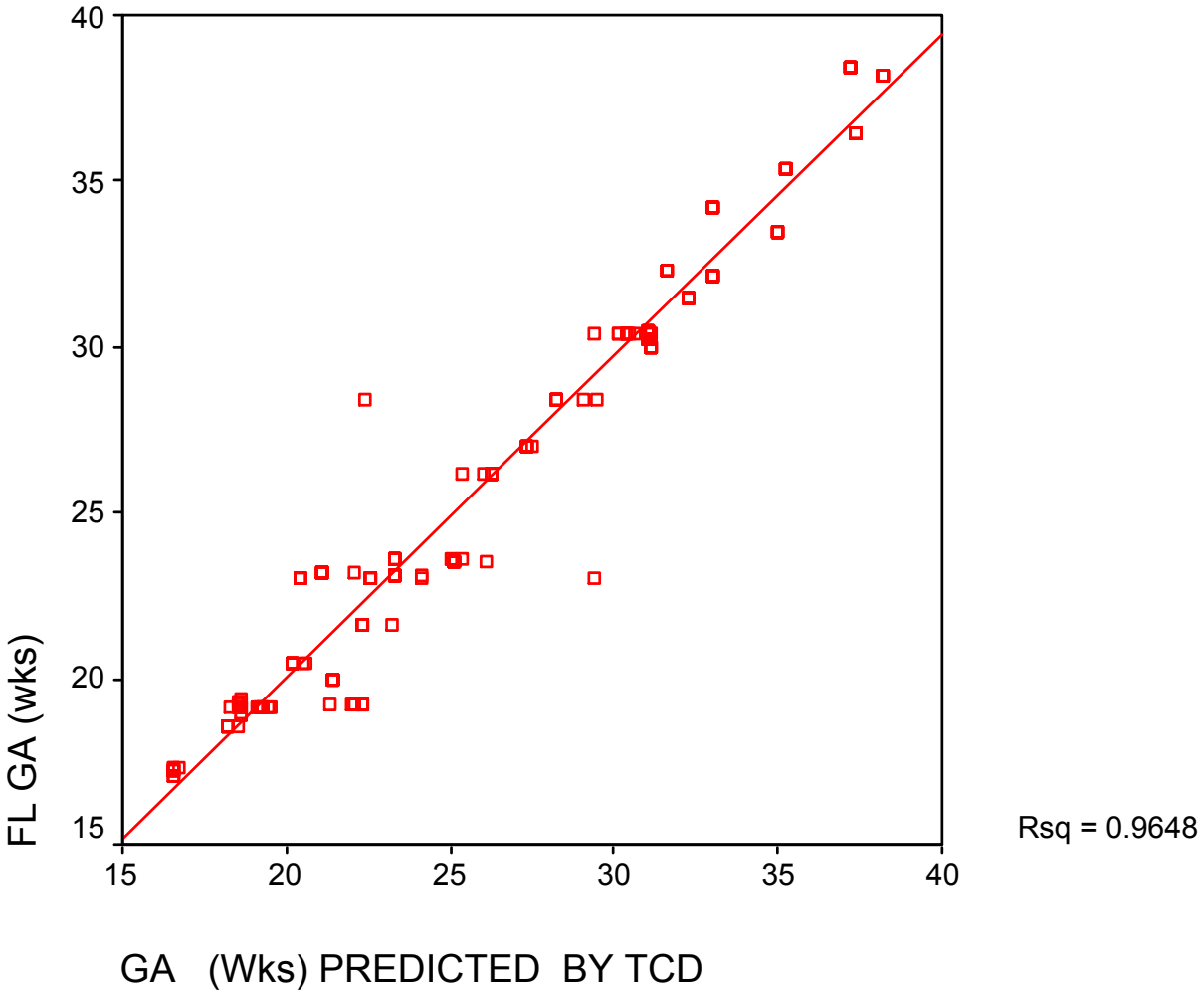


Figure 25

Above graph shows there is strong relationship between FL and TCD

AC PREDICTED GA WEEKS VS TCD PREDICTED GA WEEKS

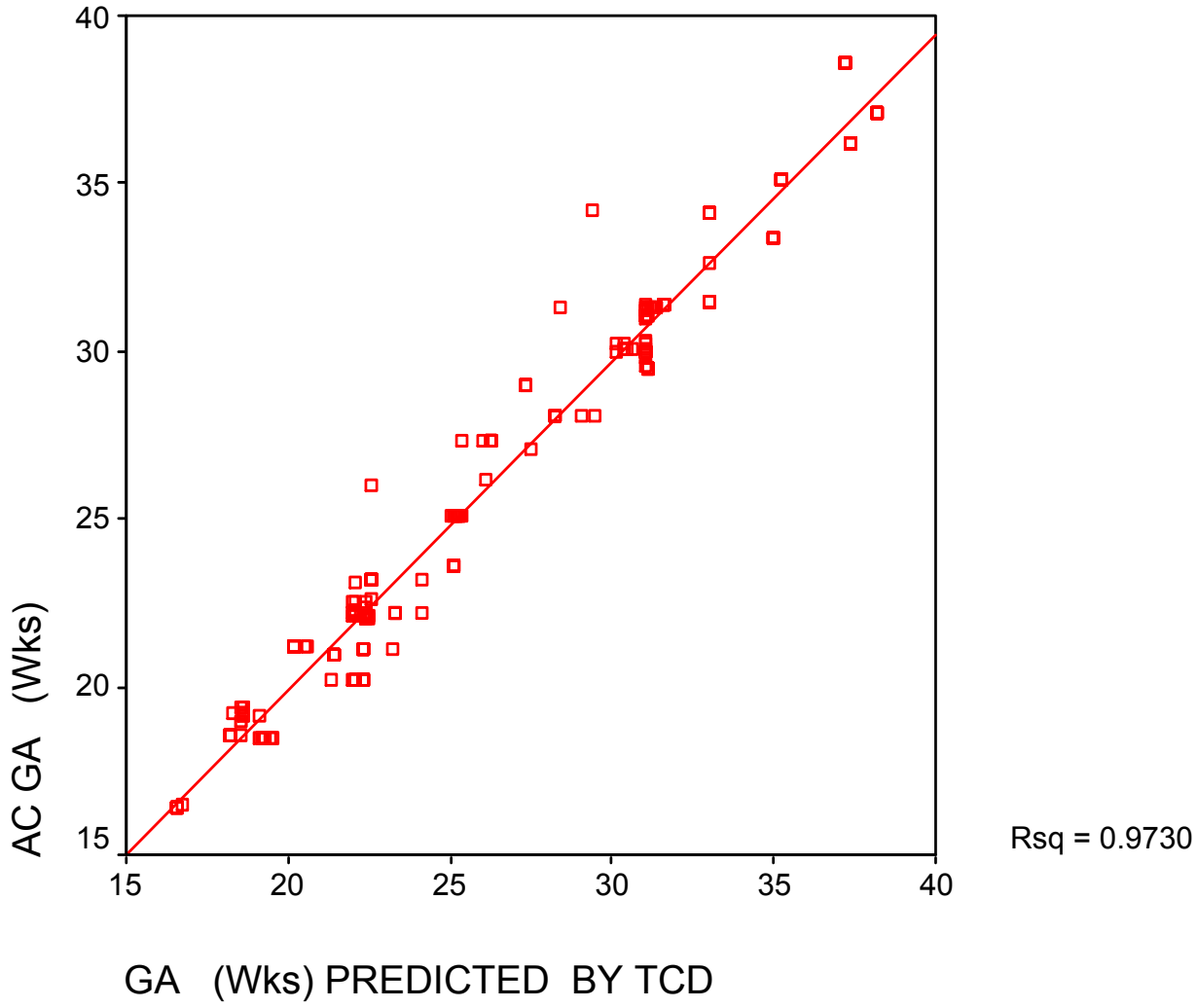


Figure 26

Above graph shows there is strong relationship between AC and TCD.

CORRELATION OF TCD GA WITH OTHER PARAMETERS GA

Table 6

GA(weeks)	Pearson's correlation	P value	Total No
BPD	.980(**)	.0001	350
FL	.987(**)	.0001	350
AC	.986(**)	.0001	350

As seen from above table though all parameters correlate well with TCD but the correlation between BPD and TCD is the least.

.

ANOVA

Table 7

	Sum of Squares	**df**	**Mean Square**	**F**	**Significance**
Between Groups	14687.203	3	4895.734	118.814	.000
Within Groups	57521.994	1396	41.205		
Total	72209.197	1399			

On Comparing the Four Parameters BPD, FL, AC, TCD by using **ANOVA statistical tool** there was significant difference between four parameters

Table 8 Post Hoc Tests (Tukey HSD) Multiple Comparisons

	(J) V2	**MEAN DIFFERENCE(I-J)**	**STD ERROR**	**SIGNIFICANCE**
(I)V2 TCD	**BPD**	1.2343(*)	.48	.0001
	FL	1.5686(*)	.47	.0001
	AC	1.6143(*)	.44	.0001

* The mean difference is significant at the .05 level

According to the POST HOC TEST "TUKEY HSD" TCD had minimum variation therefore TCD appears to be reliable parameter in gestational age determination.

Table 9 TCD Data Characteristics

TCD(MM)	FREQUENCY	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
17	12	17.23	0.45	3.75
18	12	18.1	0.173205081	1.44
19	24	19.34	0.343511281	1.43
21	12	20.94	0.664789023	5.54
22	23	22.33333333	0.351188458	1.53
23	26	23.56666667	0.318852108	1.23
24	1	24	0	0.00
25	25	25	0	0.00
26	24	26.85	0.456	1.90
29	12	30.4	0.891	7.43
31	12	31.23	0.76	6.33
32	10	32.56666667	0.230940108	2.31
34	10	34.6	0.65	6.50
35	11	35.2	0.61	5.55
38	34	38.45	0.23	0.68
39	13	38.6	0.12	0.92
41	10	40.6	0.34	3.40
42	21	42.9	0.45	2.14
46	11	46.7	0.26	2.36
47	11	47.2	0.37	3.36
52	11	52	0.11	1.00
53	14	53.4	0.1	0.71
56	11	56.5	0.25	2.27

Table 10 TCD Centiles by Gestational Age

GA	5 percentile	50 percentile	95 percentile
17	1.41	1.73	1.98
18	1.6	1.83	2.12
19	1.69	1.92	2.26
21	1.89	2.22	2.45
22	1.82	2.45	2.67
23	1.98	2.34	3.2
26	2.59	2.66	3.49
29	2.86	2.86	3.67
31	3.1	3.16	4.27
32	3.82	3.31	5.36
34	3.93	3.48	5.45
35	4.11	3.67	5.56
38	4.17	3.77	5.96

COMPARISION OF NEW WITH PREVIOUSLY AVAILABLE NOMOGRAM

SCATTER DIAGRAM TO SHOW CORRELATION BETWEEN CURRENT NOMOGRAM AND PREVIOUS NOMOGRAM

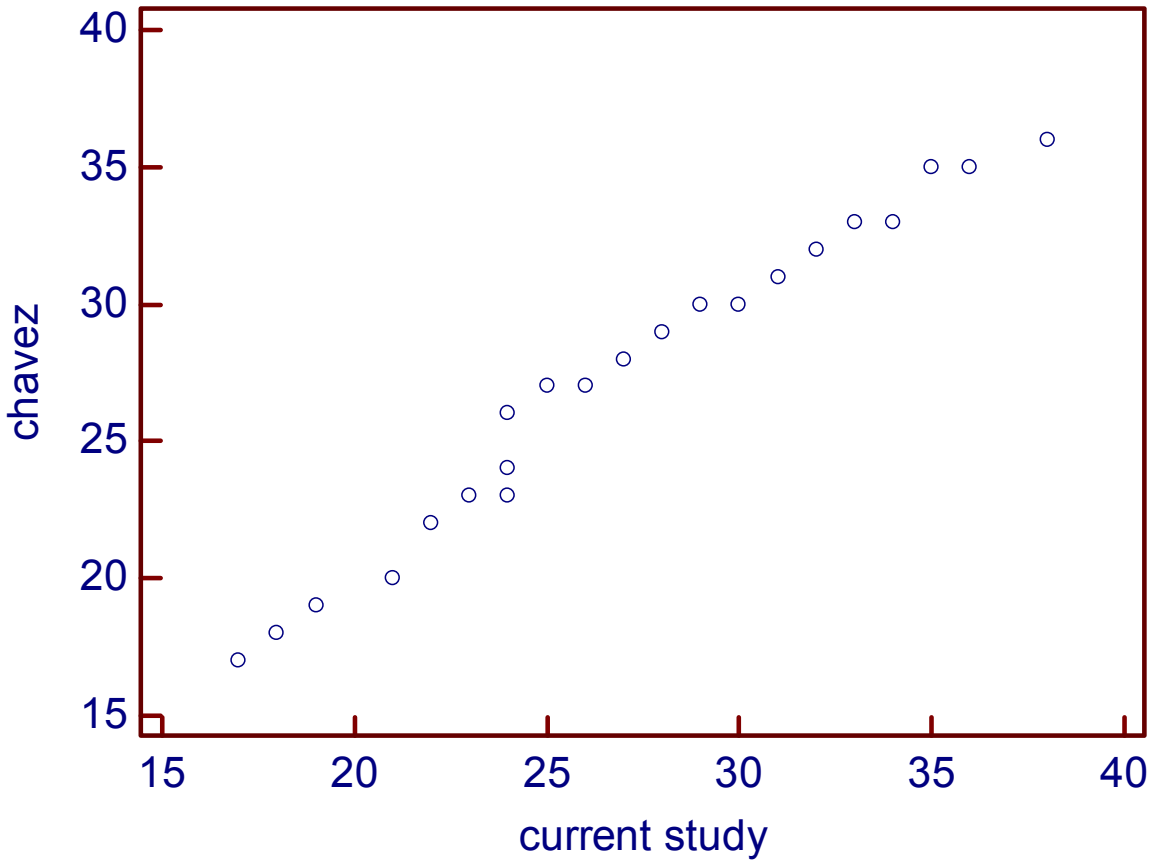


Figure 27 (A)

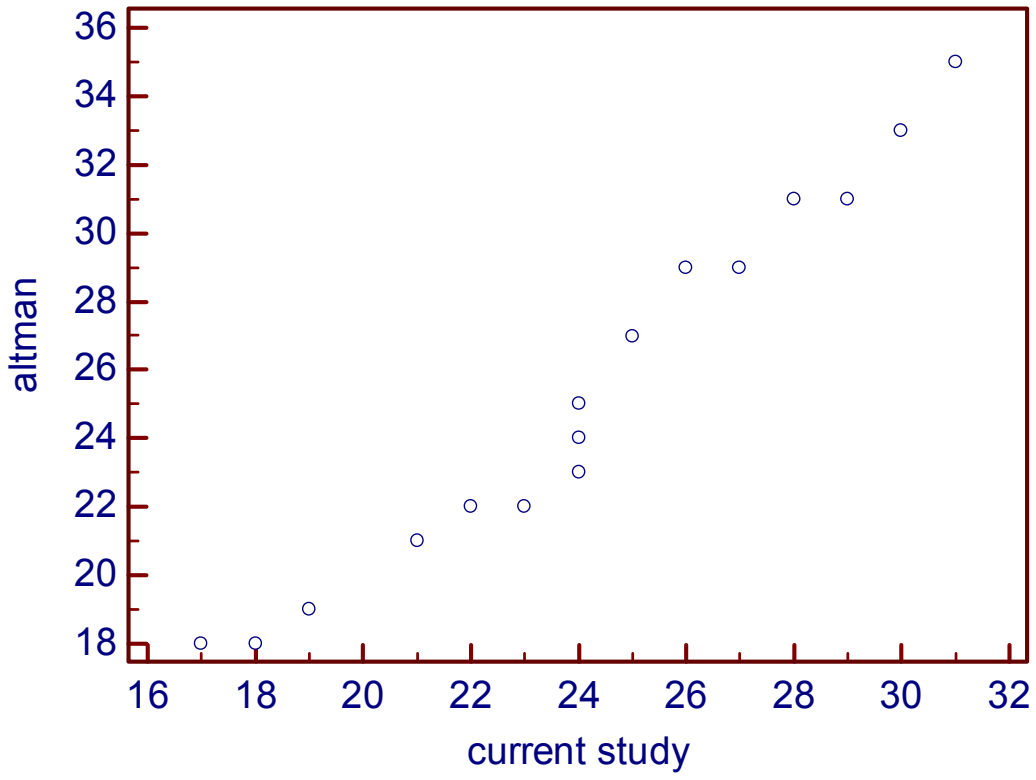


Figure 27 (B)

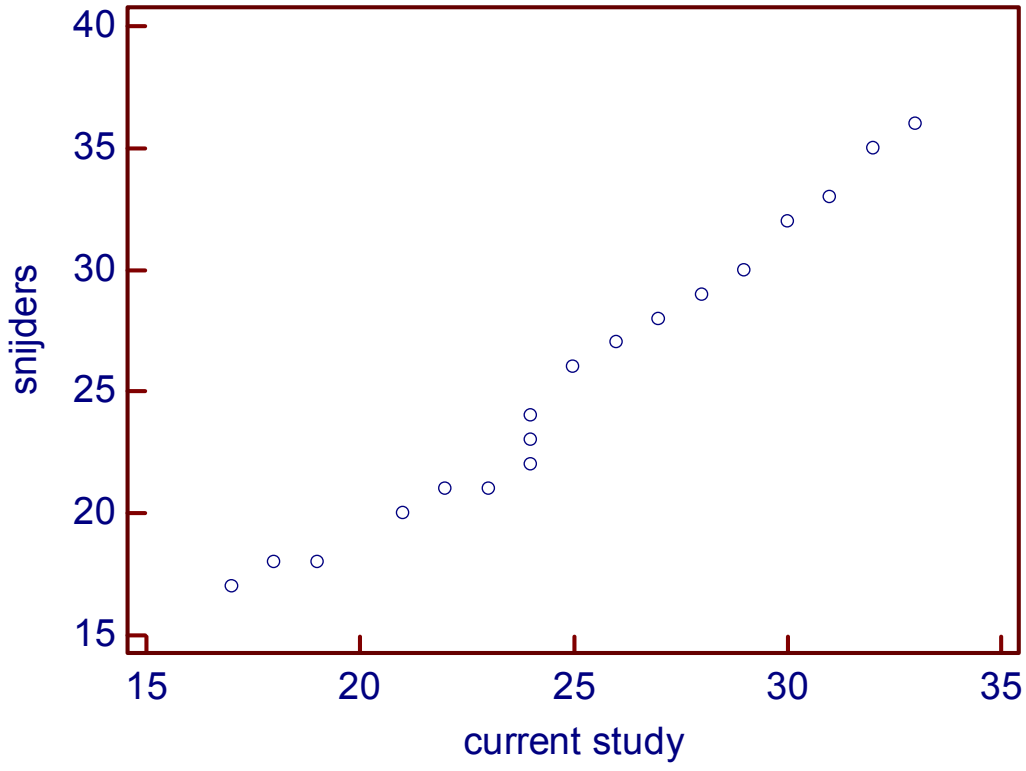


Figure 27(C). Fig 27A, B, C- Comparisons of study vs previous nomogram

CORRELATION

	ALTMAN	SNIJERS	CHAVEZ
Sample size	16	18	22
Correlation coefficient r	0.9804	0.9866	0.9872
Significance level	P<0.0001	P<0.0001	P<0.0001
95% Confidence interval for r	0.9430 to 0.9934	0.9636 to 0.9951	0.9687 to 0.9948

Table 11 shows the correlation coefficient of Altman, Snijers, Chavez are 0.9804, 0.9866, 0.9872 and was significant ($p< 0.001$).

On comparison with previous nomogram the study nomogram correlated well with all the three nomogram but correlation was more with Chavez.

DISCUSSION

The present study was undertaken on a random sample of antenatal mothers between 15 and 40 weeks of gestation attending the department over one year period. The objective of the study was "To evaluate the role of transcerebellar diameter in the estimation of gestational age in singleton pregnancies and compare it with other conventional parameters."

This study has demonstrated that there is a strong correlation between the transverse cerebellar diameter and gestational age (Pearson's correlation coefficient 0.99; P < .0001) and 97.9% of TCD can be explained by LMP gestational age. Studies by Gupta et al from Andhra Pradesh, India showed a similar association with 89.6% of TCD correlating with LMP.[30]Many western also suggests the same findings. [29, 31]

Table 13 Accuracy of GA prediction – a comparison

STUDY	Pearson correlation	P value
Reece et al	0.9803	0.0001
Goldstein et al	0.948	0.0001
Das Gupta et al	0.946	0.001
Present study	0.991	0.0001

In our study cerebellum was measurable clearly from 14 weeks onwards, most other studies suggested similarly, in a study by Prabhat Goel et al the cerebellar measurement is possible from 12-13 weeks onwards.[32]Other studies byMartin R. Chavez et al (2003),Reece et al (1989), were able to visualize the cerebellum as early as 14 weeks.[29, 33]

In our study cerebellar visualization was possible up to 38weeks after which with much difficulty technically, the study by Chavez et al (2003) also shows similar conclusion.[33]

Almost all of the available studies show linear increase in sizes of the fetal cerebellum during the second trimester and at a slower rate at later gestations. Our study also shows a similar growth of cerebellum.[30, 31,32,33,34,35,36,37.]

This study demonstrated that transcerebellar diameter measurement in millimeters corresponded exactly to the gestational weeks between 15 through 25 weeks. According to Vinkesteijn et al the measurement was exact number in weeks from 16 to 22 weeks [38]. In most other studies mentioned above the measurement was exact between 15 and 24 weeks.

On comparison of nomogram derived from my study with standard western nomogram there was no statistical difference had an excellent correlation but still the most significant correlation was with Chavez et al nomogram.

According to our study, between 16 and 23 weeks' gestation, the mean predicted GA ranged within 1 to 3 days of actual GA. between 24 and 32 weeks, the mean predicted GA was within 7 to 9 days, and at 32 weeks or greater, the mean predicted GA was within 7 days of the actual GA. However according to Chavez et al Between 16 and 23 weeks' gestation, the predicted mean GA was within 6 days of actual GA. Between 24 and 30 weeks, the predicted mean GA was within 3 days, and at 32 weeks or more, the predicted mean GA was within 5 days of the actual GA.[35]

Table 14 Accuracy of GA prediction

Gestational age	Present study	Chavez et al
16 to 23 weeks	1-3 days	6 days
24 to 32 weeks	7-9 days	3 days
More than 32 weeks	7 days	5days

In our study there was a positive correlation between BPD and TCD gestational age the correlation coefficient was 0.978 which was similar to that of Mcleary et al (1984) study correlation coefficient was0.986, p value was 0.0001.[28] Reece et al also showed a linear correlation relation

between TCD and BPD and the correlation coefficient was 0.956, p value was 0.0001.[29]

Our study showed that all the conventional parameters had good correlation with TCD which was similar to the conclusion from the above mentioned studies.

CONCLUSIONS

1. Comparison of transcerebellar gestational age with gestational age derived from last menstrual period indicates that there is a linear relationship throughout the gestational ages
2. Transcerebellar diameter measurement as a variable for gestational age is best when used between 15 and 24 weeks of gestational age.
3. There is a strong correlation of transcerebellar diameter with other conventional parameters namely Biparietal diameter, Femur length and Abdominal circumference.
4. Transcerebellar diameter is best in estimation of gestational age when compared to Biparietal diameter, Femur length and Abdominal circumference especially in the second trimester.
5. The nomogram and the regression formula derived from transcerebellar diameter measurement may be applied to determine the gestational age of fetus.
6. The main limitation of my study is failure to evaluate the inter observer and intra observer variation.

BIBLIOGRAPHY

1. World Health Organisation.2006.Neonatal and perinatal mortality: Country, regional and global estimates. WHO, Geneva.
2. Wang ML, Dorer DJ, Fleming MP, Catlin EA.2004.Clinical outcomes of near term infants.Pediartics;114:372-6
3. American College of Obstetricians and Gynecologists.Management of post term pregnancy.ACOG Practice Bulletin No 55.Obstet Gynecol 2004; 104:639-46.
4. Degani S. Fetal biometry:clinical,pathological, and technical considerations.ObstetGynaecol Sur,2001 Mar;56:159-67.
5. HohlerCW.Ultrasound estimation of gestational age. Clin Obstet Gynecol.1984 June; 27(2):314-26.
6. Hadlock FP, Deter RL, Harrist RB, Park SK. Fetal biparietal diameter: a clinical reevaluation of the relation to menstrual age by means of real-time ultrasound.Ultrasound Med.1982 Apr; 1(3):97-104.
7. Hadlock FP, Deter RL, Harrist RB, Park SK. Fetal abaominal circumference as a predictor of menstrual age.AJR Am J Roentgenol.1982 Aug; 139(2):367-70.

8. Hadlock FP, Deter RL, Harrist RB, Park SK. Fetal head circumference:relation to menstrual age. AJR Am J Roentgenol.1982 Apr; 138(4):649-53.
9. Hadlock FP, Deter RL, Harrist RB, Park SK. Fetal femur length as a predictor of menstrual age:sonographically measured. AJR Am J Roentgenol.1982 May; 138(5):875-8.
10. Chavez MR, Ananth CV, Smulian JC, et al. fetal cerebellar diameter measurements with particular emphasis in the third trimester: a reliable predictor of gestational age. Am J Obstet Gynecol. 2004; 191:979-984.
11. Maulik D: Biosaftey of diagnostic Doppler ultrasonography.In:Doppler Ultrasound in Obstetrics and Gynecology.NewYork,Springer Verlag,1997.
12. Miller MW, Brayman AA, AbramowiczJS:Obstetric ultrasonography: A biophysical consideration of patient safety-the"rules" have changed.Am J Obstet Gynecol 179: 241,1998.
13. American Institute of Ultrasound in Medicine(AIUM): American Institute of Ultrasound in Medicine Consensus Report on Potential Bioeffects of Diagnostic Ultrasound.J Ultrasound Med 27:503,2008
14. Goldenberg RL, Nelson K: Iatrogenic respiratory distress syndrome. Am J Obstet Gynecol 123: 617, 1975

15. Hack M, Fanaroff AA, Klaus MH et al: Neonatal respiratory distress following elective delivery: A preventable disease? Am J Obstet Gynecol 126: 43, 1976

16. Alexander GR, de Caunes F, Husley TC, etal.validity of postnatal assessment of gestational age: a comparison of the method of Ballard et al. and early ultrasonography. Am J Obstet Gynecol 1992; 166:891-5.

17. Campbell S, Warsof SL, Little D, Cooper DJ: Routine ultrasound screening for the prediction of gestational age. Obstet Gynecol 65: 613, 1985

18. Dewhurst CJ, Beazley JM, Campbell S: Assessment of fetal maturity and dysmaturity. Am J Obstet Gynecol 113: 141, 1972

19. Kramer MS, McLean FH, Boyd ME,etal.the validity of gestational age estimation by menstruating dating in term, preterm and post term gestations. JAMA 1988; 260:3306-8.

20. *Alexander GR, Petersen DJ,Powell-GrinerE,etal.A comparison of gestational age reporting methods based on physician estimate and date of last normal mensus from fetal death reports.Am J Public Health 1989;79:600-2*

21. Robinson HP, Flemming JEE. A critical evaluation of sonar crown rump length measurement. Br J Obstet Gynecol. 1975; 82:702-712.

22. Lasser DM, Peisner DB, Vollebergh J, et al.First trimester fetal biometery using transvaginalsonography.Ultrasound Obstet Gynecol 1993;3:104-8.

23. Bennett KA, Crane JM, O'Shea P, et al. first trimester ultrasound screening is effective in reducing post term labour induction rates: a randomized controlled trail. Am J Obstet Gynecol 2004;190:1077-81
24. Jones TB, Wolfe HM, Zandor IE. Biparietal diameter and femur length discrepancies: are maternal characteristics important? Ultrasound Obstet Gynaecol. 1991;1: 405-409
25. Smith PA, Johansson D, Tzannatos C, Campbell S: Prenatal measurement of the fetal cerebellum and cisterna cerebellomedullaris by ultrasound. PrenatDiagn1986; 6:133
26. Reece EA, Goldstein I, Pilu G, Hobbins JC: Fetal cerebellar growth unaffected by intrauterine growth retardation: A new parameter for prenatal diagnosis. Am J ObstetGynecol1987; 157:632
27. Ott WJ. Accurate gestational dating. Obstst Gynecol. 1985;66:311-315
28. McLeary RD, Kuhns LR, Barr M, Jr. Ultrasonography of the fetal cerebellum.Radiology 1984; 151:439-442.
29. Goldstein I, Reece EA, Pilu G, Bovicelli L, Hobbins JC. Cerebellar measurements with ultrasonography in the evaluation of fetal growth and development. Am J Obstet Gynecol 1987; 156:1065-9.
30. Gupta AD, Banerjee A, Rammurthy N, Revati P, Jose J, Karak P, Kumar A. Gestational age estimation using transcerebellar diameter with grading of fetal cerebellar growth. NJCA. (2012), [cited December 19, 2013]; 1(3): 115-120.

31. Montenegro NA, Leite LP. Fetal cerebellar measurement second trimester ultrasonography-clinical value. J Perinat Med1989; 17:365-9.
32. Prabhat Goel,MukeshSingla,RashmiGhai et al. Transverse Cerebellar Diameter - A Marker for Estimation of Gestational Age.Journal of anatomical society of India 2010;59:158-161.
33. Chavez MR, Ananth CV, Smulian JC, Lashley S, Kontopoulos EV, Vintzileos AM. Fetal transcerebellar diameter nomogram in singleton gestations with special emphasis in the third trimester: a comparison with previously published nomograms. Am J Obstet Gynecol 2003; 189:1021-1025.
34. Martin R. Chavez, MD,a Cande V. Ananth,et al. Fetal transcerebellar diameter nomogram in singleton gestations with special emphasis in the third trimester: A comparison with previously published nomograms. Am J Obstet Gynecol 2003; 189: 1021-1025.
35. Chavez, M., Ananth, C., Kaminsky, L., Smulian, J., Yeo, L., &Vintzileos, A. (2006). Fetal transcerebellar diameter measurement for prediction of gestational age in twins. *American Journal Of Obstetrics And Gynecology*, *195*(6), 1596-1600.
36. Snijders RJ, Nicolaides KH. Fetal biometry at 14 to 40 weeks' of gestation. Ultrasound Obstet Gynecol 1994; 4:34-8.
37. Altmam DG, Chitty LS. Charts for fetal size: 1, methodology. BJOG 1994; 101:29-34.

38. Vinkensteijn AS, Mulder PG, WlaclimiroffJW.Fetal transverse cerebellar diameter measurements in normal and reduced fetal growth.Ultrasound Obstet Gynecol 2000;1:47-51.

PROFOMA

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EDUCATION QUALIFICATION:

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LMP:

EDD:

PREGNANCY CONFIRMED BY 1.UPT

2. USG

WILLING TO PAICIPATE IN THE STUDY:

BOOKED & IMMUNISED:

REFFERED FROM:

MENSTURAL HISTORY:

MARITAL HISTORY:

OBSTETRIC HISTORY:

PAST HISTORY:

GENERAL EXAMINATION:

HEIGHT

WEIGHT

BMI

VITALS

CVS:

RS:

PER ABDOMINAL EXAMINATION:

INVESTIGATIONS:

1. CBC

2. RFT

3. URINE ROUTINE

4. VDRL

5. HIV

6. HBSAg

7. OTHERS

8. USG

	1 ST TRIMESTER	2ND TRIMESTER	3 RD TRIMESTER
CRL			
BPD			
FL			
AC			
TCD			
PLACENTA			
EFW			

INFORMATION SHEET

We are conducting a study on **"RANDOMISED PROSPECTIVE STUDY OF FETAL AGE ESTIMATION BY USING UGS GUIDED TRANSCEREBELLAR DIAMETER AT 15-40 WEEKS IN O&G DEPARTMENT KILPAUK MEDICAL COLLEGE"** among patients attending Kilpauk medical college Hospital, Chennai and for that your specimen may be valuable to us.

The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator | Signature of Participant

Date :

Place :

PATIENT CONSENT FORM

Study Detail : **"RANDOMISED PROSPECTIVE STUDY OF FETAL AGE ESTIMATION BY USING UGS GUIDED TRANSCEREBELLAR DIAMETER AT 15-40 WEEKS IN O&G DEPARTMENT KILPAUK MEDICAL COLLEGE"**

Study Centre : Kilpauk medical college Hospital, Chennai.
Patient's Name :
Patient's Age :
Identification Number :

Patient may check (√) these boxes

a) I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ☐
b) I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ☐
c) I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ☐
d) I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ☐
e) I hereby consent to participate in this study. ☐
f) I hereby give permission to undergo complete clinical examination and hematological tests. ☐

Signature/thumb impression	Signature of Investigator
Patient's Name and Address:	Study Investigator's Name: **Dr.S.RENUKA**

INSTITUTIONAL ETHICAL COMMITTEE
GOVT.KILPAUK MEDICAL COLLEGE,
CHENNAI-10

Ref.No.9677/ME-1/Ethics/2012 Dr:01.11.2012.

CERTIFICATE OF APPROVAL

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "A Study on randomized prospective study of fetal age estimation by using USG guided tanscerebellar diameter at 15-40 WKS done in O&G Department, Kilapuk Medical College" – For Dissertation purpose" submitted by Dr.Renuka.S, MS (O&G), PG Student, KMC, Chennai-10.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

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Submission time	23-Dec-2013 02:40PM
Total words	10396

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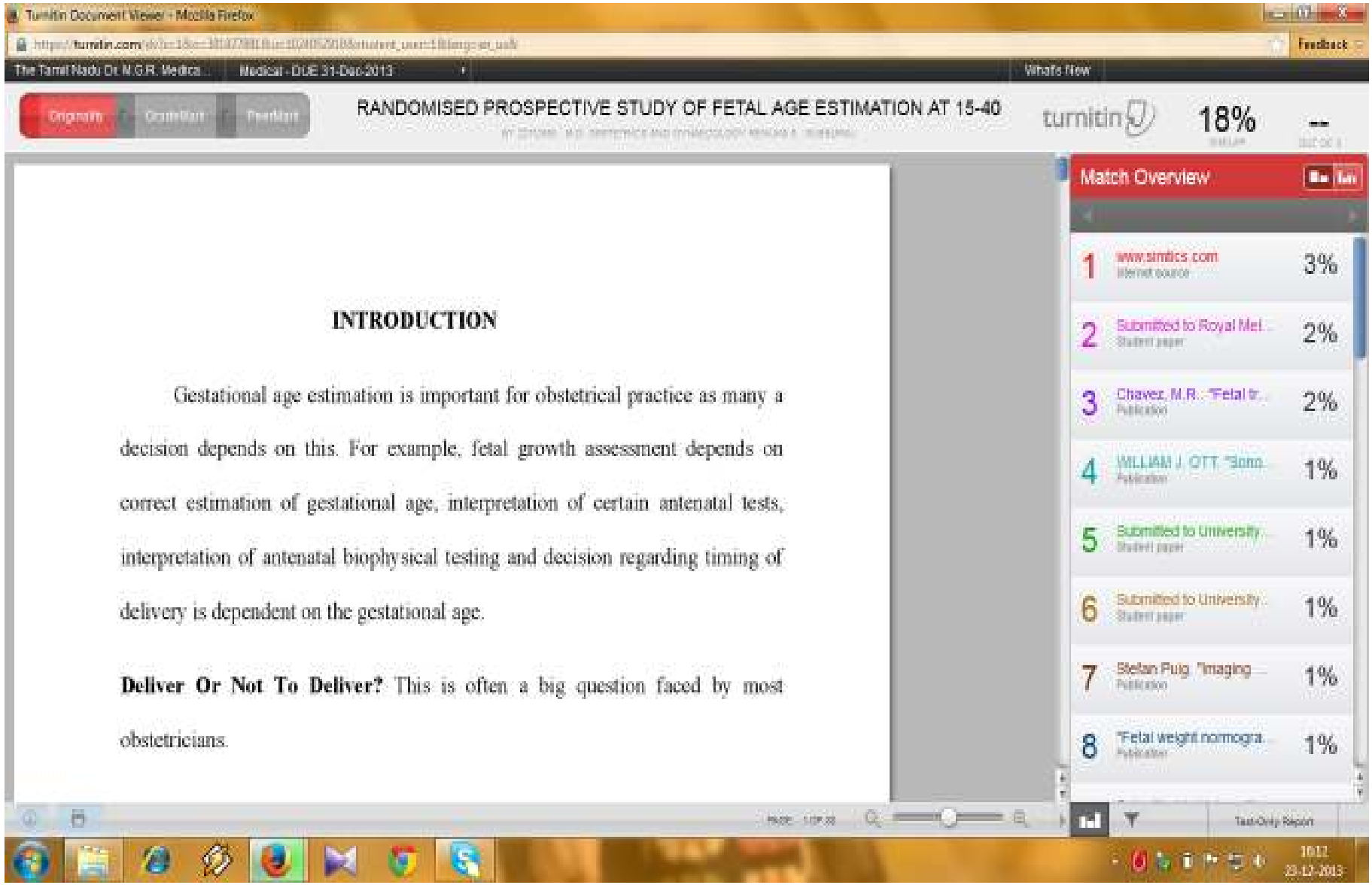
INTRODUCTION Gestational age estimation is important for obstetrical practice as many a decision depends on this. For example, fetal growth assessment depends on correct estimation of gestational age, interpretation of certain antenatal tests, interpretation of antenatal biophysical testing and decision regarding timing of delivery is dependent on the gestational age. Deliver Or Not To Deliver? This is often a big question faced by most obstetricians. They are faced with this question under these circumstances, ? Will it be a premature delivery ? Is it really a post term pregnancy ? In cases of medical disease complicating pregnancy where there is a need for early termination We all are...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INTRODUCTION
Gestational age estimation is important for obstetrical practice as many a decision depends on this. For example, fetal growth assessment depends on correct estimation of gestational age, interpretation of certain antenatal tests, interpretation of antenatal biophysical testing and decision regarding timing of delivery is dependent on the gestational age.
Deliver Or Not To Deliver? This is often a big question faced by most obstetricians.
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SL.NO	AGE	GRAVIDA	PARA	HEIGHT	LOCALITY	EDUCATION	CHECK UP	LMP			BPD		FL		AC		TCD	
								DATE	GA (WKS)	CLR	MM	GA (WKS)	MM	GA (WKS)	MM	GA (WKS)	MM	GA (WKS)
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2	28	1	0	167	Urban	Literate	Regular	11-02-2011	22W3D	24.30	57	22W2D	41	23W2D	183	22W3D	22	22W1D
3	23	1	0	166	Urban	Literate	Regular	26-11-2011	30W0D	34.20	77	30W6D	58	30W2D	220	30W1D	38	31W0D
4	20	1	0	168	Urban	Literate	Regular	05-07-2011	18W3D	20.50	46	18W4D	31	19W1D	137	19W1D	19	19W1D
5	28	0	0	170	Urban	Literate	Regular	13-09-2011	25W3D	24.90	46	25W1D	43	23W6D	204	25W1D	26	25W4D
6	19	2	1	172	Urban	Literate	Regular	18-03-2012	16W5D	18.70	76	16W6D	25	17W3D	135	16W5D	17	16W7D
7	21	1	0	168	Urban	Literate	Regular	28-11-2011	19W3D	20.10	47	19W4D	31	19W1D	133	18W5D	18	19W5D
8	26	5	2	164	Urban	Literate	Regular	19-02-2012	20W6D	22.20	46	30W6D	35	20W5D	162	21W2D	21	20W6D
9	18	1	0	161	Urban	Literate	Regular	27-09-2011	22W2D	24.10	76	22W3D	31	19W2D	153	20W2D	23	22W1D
10	28	1	0	171	Urban	Literate	Regular	15-02-2012	26W2D	27.50	76	26W1D	43	26W2D	187	26W2D	29	26W1D
11	25	1	0	167	Urban	Literate	Regular	31-01-2012	24W0D	26.10	71	27W5D	41	23W1D	177	22W2D	26	23W3D
12	28	1	0	158	Urban	Literate	Regular	29-02-2012	25W6D	29.10	47	25W2D	50	26W2D	225	27W3D	31	26W0D
13	23	2	1	167	Urban	Literate	Regular	23-03-2012	18W4D	19.80	76	18W4D	29	18W6D	134	18W6D	19	18W5D
14	25	2	0	170	Urban	Literate	Regular	24-12-2011	22W5D	24.60	76	22W4D	41	23W0D	182	23W2D	25	24W1D
15	24	1	0	153	Urban	Literate	Regular	10-07-2011	22W3D	22.70	71	22W3D	41	23W2D	183	22W4D	22	22W4D
16	23	1	0	170	Urban	Literate	Regular	15-08-2011	30W0D	33.80	77	30W6D	58	30W2D	220	30W2D	38	31W0D
17	27	2	0	158	Urban	Literate	Regular	24-07-2011	18W3D	19.80	76	18W3D	31	19W1D	137	19W2D	19	18W3D
18	24	1	0	164	Urban	Literate	Regular	26-11-2011	25W3D	24.90	76	25W0D	43	23W6D	204	25W1D	26	25W0D
19	25	2	1	171	Urban	Literate	Regular	09-09-2011	16W5D	18.60	71	16W4D	25	17W1D	134	16W4D	17	16W6D
20	22	1	0	166	Urban	Literate	Regular	17-07-2011	19W3D	20.10	47	19W3D	31	19W1D	133	18W5D	18	19W5D
21	31	1	0	169	Urban	Literate	Regular	12-09-2011	20W6D	22.60	48	19W3D	35	20W5D	162	21W2D	21	20W5D
22	22	2	1	156	Urban	Literate	Regular	10-07-2011	22W2D	23.70	76	22W3D	31	19W2D	153	20W2D	23	22W1D
23	28	1	0	169	Urban	Literate	Regular	23-03-2012	26W2D	27.10	71	27W5D	43	23W5D	187	23W6D	29	25W1D
24	28	1	0	166	Urban	Literate	Regular	27-02-2012	24W0D	24.90	77	30W6D	41	23W1D	177	22W2D	26	24W1D
25	24	1	0	158	Urban	Literate	Regular	05-02-2012	25W6D	27.50	45	25W3D	50	26W2D	225	27W3D	31	25W4D
26	19	2	1	161	Urban	Literate	Regular	02-09-2011	18W4D	21.00	76	18W3D	29	18W6D	134	18W6D	19	18W2D
27	21	2	1	158	Urban	Literate	Regular	17-03-2012	33W5D	36.20	71	33W6D	61	33W1D	265	32W6D	42	33W0D
28	22	1	0	155	Urban	Literate	Regular	04-12-2011	23W0D	23.50	77	30W6D	38	21W6D	160	21W1D	25	23W2D

29	29	2	1	152	Urban	Literate	Regular	08-03-2012	30W1D	31.00	76	30W6D	58	30W4D	288	30W1D	35	30W5D
30	25	1	0	166	Urban	Literate	Regular	02-10-2011	29W6D	33.80	76	30W0D	58	30W5D	248	30WOD	38	31W0D
31	24	2	1	170	Urban	Literate	Regular	21-01-2012	30W4D	32.30	71	27W5D	57	30W0D	255	29W5D	38	31W1D
32	27	1	0	167	Semi urban	Literate	Referred	24-10-2011	22W5D	22.00	76	30WOD	41	26W1D	186	26W0D	24	22W6D
33	27	2	1	172	Urban	Literate	Regular	02-02-2012	38W6D	39.60	76	38W5D	77	38W4D	322	38W6D	52	37W2D
34	20	1	0	168	Urban	Literate	Regular	13-09-2011	34W6D	37.60	87	30W6D	70	35W4D	308	35W1D	47	35W2D
35	23	1	0	166	Urban	Literate	Regular	16-11-2011	39W2D	40.20	90	39W2D	74	38W2D	332	37W1D	56	38W2D
36	25	2	1	157	Urban	Literate	Regular	18-02-2012	29W2D	30.20	76	30W6D	55	28W4D	240	28W1D	34	29W1D
37	24	4	3	155	Urban	Literate	Regular	13-02-2012	35W5D	35.80	88	30W6D	65	33W5D	296	33W4D	46	35W0D
38	22	3	2	165	Urban	Literate	Regular	26-11-2011	31W0D	34.30	78	30W6D	61	31W5D	227	31W3D	41	31W3D
39	26	2	1	162	Urban	Literate	Regular	05-07-2011	27W4D	29.30	47	25W1D	51	27W0D	237	27W1D	32	27W5D
40	23	1	0	157	Urban	Literate	Regular	13-09-2011	33W3D	35.40	85	31W2D	67	34W2D	302	34W1D	42	33W0D
41	21	2	0	164	Urban	Literate	Regular	18-03-2012	38W0D	40.20	90	38W0D	69	36W4D	302	36W2D	53	37W4D
42	19	1	0	167	Urban	Literate	Regular	28-11-2011	21W2D	24.60	46	22W4D	33	20W0D	159	21W0D	23	21W4D
43	26	2	1	174	Urban	Literate	Regular	19-02-2012	31W0D	34.00	81	31W1D	58	32W3D	288	31W4D	39	31W6D
44	23	1	0	167	Urban	Literate	Regular	27-09-2011	22W5D	23.80	61	22W2D	41	23W0D	182	23W2D	25	22W6D
45	27	1	0	158	Urban	Literate	Regular	15-02-2012	22W3D	24.30	57	22W5D	41	23W2D	183	23W1D	22	22W1D
46	18	4	2	161	Urban	Literate	Regular	31-01-2012	30W0D	31.80	77	31W2D	58	30W2D	220	30W3D	38	31W0D
47	26	1	0	168	Urban	Literate	Regular	29-02-2012	18W3D	20.60	44	19W1D	31	19W1D	137	19W2D	19	18W6D
48	19	1	0	170	Urban	Literate	Regular	23-03-2012	25W3D	25.30	60	25W4D	43	23W6D	204	25W1D	26	25W3D
49	26	3	1	170	Urban	Literate	Regular	24-12-2011	16W5D	18.60	37	17W2D	25	17W2D	133	16W4D	17	16W6D
50	19	3	1	155	Urban	Literate	Regular	10-07-2011	19W3D	20.10	46	19W4D	31	19W1D	133	18W5D	18	19W2D
51	22	2	1	159	Urban	Literate	Regular	15-08-2011	20W6D	22.60	49	20W5D	35	20W5D	162	21W2D	21	20W2D
52	23	1	0	152	Urban	Literate	Regular	12-10-2011	22W2D	22.10	49	22W1D	31	19W2D	153	20W2D	23	22W3D
53	21	1	0	161	Urban	Literate	Regular	08-11-2011	26W2D	28.30	61	23W5D	43	23W5D	187	23W6D	29	25W1D
54	19	1	0	150	Urban	Literate	Regular	22-07-2011	24W0D	25.30	56	23W1D	41	23W1D	177	22W2D	26	23W3D
55	24	2	1	169	Urban	Literate	Regular	30-10-2011	25W6D	28.30	68	26W2D	50	26W2D	225	27W3D	31	26W3D
56	27	1	0	154	Urban	Literate	Regular	05-02-2012	18W4D	19.00	43	18W6D	29	18W6D	134	18W6D	19	18W2D
57	26	1	0	164	Urban	Literate	Regular	03-11-2011	33W5D	36.20	79	32W1D	61	32W1D	265	31W5D	42	33W0D
58	20	3	2	167	Urban	Literate	Regular	06-03-2012	23W0D	24.70	55	21W6D	38	21W6D	160	21W1D	25	22W3D
59	24	2	1	159	Urban	Literate	Regular	22-08-2011	30W1D	31.80	81	30W4D	58	30W4D	288	31W1D	35	31W1D
60	19	1	0	164	Urban	Literate	Regular	21-08-2011	29W6D	32.60	76	30W5D	58	30W5D	248	30W0D	38	31W0D
61	18	1	0	167	Urban	Literate	Regular	09-07-2011	30W4D	33.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
62	23	1	0	168	Urban	Literate	Regular	08-12-2011	22W5D	23.60	54	23W0D	41	23W0D	186	22W1D	22	22W5D

63	21	1	0	173	Urban	Literate	Regular	09-02-2012	38W6D	39.20	90	38W4D	77	38W4D	322	38W6D	52	37W2D
64	26	2	1	159	Urban	Literate	Regular	18-01-2012	34W6D	38.00	87	35W4D	70	35W4D	308	35W1D	47	35W2D
65	21	1	0	163	Urban	Literate	Regular	17-11-2011	39W2D	40.20	90	38W2D	74	38W2D	332	37W1D	56	38W2D
66	21	1	0	163	Urban	Literate	Regular	22-03-2012	29W2D	29.80	76	28W4D	55	28W4D	240	28W1D	34	28W2D
67	19	1	0	160	Urban	Literate	Regular	12-10-2011	35W5D	38.20	88	33W5D	65	33W5D	296	33W4D	46	35W0D
68	23	2	1	154	Urban	Literate	Regular	01-09-2011	31W0D	35.50	78	31W5D	61	31W5D	227	31W3D	41	31W4D
69	24	1	0	170	Urban	Literate	Regular	12-09-2011	27W4D	28.50	71	27W0D	51	27W0D	237	29W0D	32	27W3D
70	19	3	2	157	Urban	Literate	Regular	24-07-2011	33W3D	34.60	85	34W2D	67	34W2D	302	34W1D	42	33W0D
71	21	1	0	161	Urban	Literate	Regular	26-11-2011	38W0D	39.40	90	38W2D	69	36W4D	302	36W2D	53	37W4D
72	24	2	0	167	Urban	Literate	Regular	09-09-2011	21W2D	24.20	46	21W2D	33	20W0D	159	21W0D	23	21W4D
73	26	1	0	160	Urban	Literate	Regular	17-07-2011	31W0D	33.60	81	32W3D	58	32W3D	288	31W4D	39	31W6D
74	21	1	0	162	Urban	Literate	Regular	12-09-2011	22W5D	25.00	61	22W3D	41	23W0D	182	23W2D	25	22W6D
75	24	2	1	157	Urban	Literate	Regular	10-07-2011	22W3D	23.90	57	23W2D	41	23W2D	183	22W3D	22	22W1D
76	27	1	0	150	Urban	Literate	Regular	23-03-2012	30W0D	33.00	77	30W2D	58	30W2D	220	31W1D	38	31W0D
77	22	1	0	152	Urban	Literate	Regular	27-02-2012	18W3D	21.40	45	19W1D	31	19W1D	138	19W2D	19	18W6D
78	22	1	0	172	Urban	Literate	Regular	05-02-2012	25W3D	24.90	60	25W3D	43	23W6D	204	25W1D	26	25W3D
79	18	2	1	155	Urban	Literate	Regular	02-09-2011	16W5D	19.40	37	17W2D	25	17W2D	133	16W4D	17	16W6D
80	24	1	0	166	Urban	Literate	Regular	17-03-2012	19W3D	18.90	46	19W1D	31	19W1D	133	18W5D	18	19W3D
81	24	2	0	170	Urban	Literate	Regular	04-12-2011	20W6D	21.00	49	20W5D	35	20W5D	162	21W2D	21	20W2D
82	21	1	0	160	Urban	Literate	Regular	08-03-2012	22W2D	24.10	49	22W1D	31	19W2D	153	20W2D	23	22W3D
83	20	1	0	176	Urban	Literate	Regular	02-10-2011	26W2D	27.10	61	23W5D	43	23W5D	187	23W6D	29	25W1D
84	24	2	1	159	Urban	Literate	Regular	21-01-2012	24W0D	25.30	56	23W1D	41	23W1D	177	22W2D	26	23W3D
85	27	2	1	150	Urban	Literate	Regular	24-10-2011	25W6D	28.70	68	26W2D	50	26W2D	225	27W3D	31	26W3D
86	19	1	0	153	Urban	Literate	Regular	21-10-2011	18W4D	19.80	43	18W6D	29	18W6D	134	18W6D	19	18W2D
87	25	2	1	161	Urban	Literate	Regular	21-03-2012	33W5D	34.60	79	32W1D	61	32W1D	265	31W5D	42	33W0D
88	27	1	0	169	Urban	Literate	Regular	27-06-2011	23W0D	25.10	55	21W6D	38	21W6D	160	21W1D	25	22W3D
89	23	1	0	157	Urban	Literate	Regular	18-10-2011	30W1D	32.20	81	30W4D	58	30W4D	288	31W3D	35	31W1D
90	24	1	0	168	Urban	Literate	Regular	04-03-2012	29W6D	33.00	76	30W5D	58	30W5D	248	30W0D	38	31W0D
91	22	2	1	163	Urban	Literate	Regular	24-01-2012	30W4D	33.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
92	19	1	0	153	Urban	Literate	Regular	08-10-2011	22W5D	22.00	54	23W0D	41	23W0D	186	22W5D	22	22W0D
93	28	2	0	169	Urban	Literate	Regular	21-03-2012	38W6D	38.40	90	38W4D	77	38W4D	322	38W6D	52	37W2D
94	22	1	0	160	Urban	Literate	Regular	09-06-2011	34W6D	38.40	87	35W4D	70	35W4D	308	35W1D	47	35W2D
95	24	3	0	160	Urban	Literate	Regular	18-07-2011	39W2D	39.80	90	38W2D	74	38W2D	332	37W1D	56	38W2D
96	25	2	1	154	Urban	Literate	Regular	27-03-2012	29W2D	31.00	76	28W4D	55	28W4D	240	28W1D	34	28W2D

97	24	1	0	155	Urban	Literate	Regular	23-03-2012	35W5D	37.00	88	33W5D	65	33W5D	296	33W4D	46	35W0D
98	19	1	0	150	Urban	Literate	Regular	23-02-2012	31W0D	35.10	78	31W5D	61	31W5D	227	31W3D	41	31W2D
99	20	2	1	157	Urban	Literate	Regular	03-03-2012	27W4D	28.90	71	27W0D	51	27W0D	237	29W0D	32	27W3D
100	25	2	1	147	Urban	Literate	Regular	02-03-2012	33W3D	35.40	85	34W2D	67	34W2D	302	34W1D	42	33W0D
101	27	5	1	149	Urban	Literate	Regular	02-03-2012	38W0D	40.20	90	38W4D	69	36W4D	302	36W2D	53	37W4D
102	18	4	1	160	Urban	Literate	Regular	09-12-2011	21W2D	24.60	46	21W1D	33	20W0D	159	21W0D	23	21W4D
103	22	1	0	150	Urban	Literate	Regular	16-11-2011	31W0D	34.80	81	32W3D	58	32W3D	288	31W4D	39	31W6D
104	24	1	0	152	Urban	Literate	Regular	08-11-2011	22W5D	24.60	61	23W0D	41	23W0D	182	23W2D	25	22W6D
105	18	4	1	165	Urban	Literate	Regular	11-11-2011	22W3D	23.10	57	23W2D	41	23W2D	183	22W1D	22	22W1D
106	25	2	1	150	Urban	Literate	Regular	09-01-2012	30W0D	33.00	77	30W2D	58	30W2D	220	31W2D	38	31W0D
107	18	1	0	153	Urban	Literate	Regular	19-07-2011	18W3D	20.20	45	19W1D	31	19W1D	139	19W2D	19	18W6D
108	23	2	1	164	Urban	Literate	Regular	06-02-2012	25W3D	26.10	60	25W3D	43	23W6D	204	25W1D	26	25W2D
109	18	1	0	156	Urban	Literate	Regular	29-03-2012	16W5D	18.60	37	17W3D	25	17W3D	133	16W4D	17	16W6D
110	25	3	1	152	Urban	Literate	Regular	30-03-2012	19W3D	19.70	46	19W1D	31	19W1D	133	18W5D	18	19W3D
111	24	2	1	164	Urban	Literate	Regular	11-03-2012	20W6D	22.20	49	20W5D	35	20W5D	162	21W2D	21	20W2D
112	23	1	0	166	Urban	Literate	Regular	17-06-2011	22W2D	22.90	49	22W3D	31	19W2D	153	20W2D	23	22W1D
113	24	1	0	169	Semi urban	Literate	Regular	24-12-2011	26W2D	27.90	61	23W5D	43	23W5D	187	23W6D	29	25W1D
114	18	2	0	168	Urban	Literate	Regular	30-10-2011	24W0D	24.90	56	23W1D	41	23W1D	177	22W2D	26	23W3D
115	27	5	1	153	Urban	Literate	Regular	10-01-2012	25W6D	28.70	68	26W2D	50	26W2D	225	27W3D	31	26W3D
116	28	1	0	156	Semi urban	Literate	Regular	18-07-2011	18W4D	20.20	43	18W6D	29	18W6D	134	18W6D	19	18W2D
117	24	1	0	158	Urban	Literate	Regular	02-10-2011	33W5D	35.80	79	32W1D	61	32W1D	265	31W5D	42	33W0D
118	22	2	1	151	Urban	Literate	Regular	17-10-2011	23W0D	23.90	55	21W6D	38	21W6D	160	21W1D	25	22W3D
119	20	1	0	157	Semi urban	Literate	Regular	04-09-2011	30W1D	31.80	81	30W4D	58	30W4D	288	30W2D	35	30W1D
120	27	2	1	160	Urban	Literate	Regular	04-12-2011	29W6D	33.80	76	30W5D	58	30W5D	248	30W0D	38	31W0D
121	26	1	0	155	Urban	Literate	Regular	27-06-2011	30W4D	31.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
122	20	1	0	163	Semi urban	Literate	Regular	14-02-2012	22W5D	22.80	54	23W0D	41	23W0D	186	22W2D	22	22W4D
123	23	4	2	157	Urban	Literate	Regular	29-09-2011	38W6D	38.80	90	38W4D	77	38W4D	322	38W6D	52	37W2D
124	24	1	0	159	Urban	Literate	Regular	15-08-2011	34W6D	36.40	87	35W4D	70	35W4D	308	35W1D	47	35W2D
125	25	3	0	164	Semi urban	Literate	Regular	13-10-2011	39W2D	39.80	90	38W2D	74	38W2D	332	37W1D	56	38W2D
126	20	1	0	170	Urban	Literate	Regular	12-12-2011	29W2D	29.40	76	28W4D	55	28W4D	240	28W1D	34	28W2D
127	27	2	1	151	Urban	Literate	Regular	26-11-2011	35W5D	36.20	88	33W5D	65	33W5D	296	33W4D	46	35W0D
128	25	1	0	161	Semi urban	Literate	Regular	07-02-2012	31W0D	34.70	78	31W5D	61	31W5D	227	31W3D	41	31W2D
129	26	2	1	167	Urban	Illiterate	Referred	01-02-2012	27W4D	28.50	71	27W0D	51	27W0D	237	29W0D	32	27W3D
130	27	1	0	157	Urban	Literate	Regular	18-12-2011	33W3D	35.80	85	34W2D	67	34W2D	302	34W1D	42	33W0D

131	21	3	2	169	Semi urban	Literate	Regular	18-11-2011	38W0D	38.60	90	36W4D	69	36W4D	302	36W2D	53	37W4D
132	21	1	0	156	Urban	Illiterate	Regular	01-04-2012	21W2D	24.60	46	21W0D	33	20W0D	159	21W0D	23	21W4D
133	24	1	0	155	Urban	Literate	Referred	22-12-2011	31W0D	34.40	81	32W3D	58	32W3D	288	31W4D	39	31W6D
134	18	1	0	168	Semi urban	Literate	Referred	15-03-2012	22W5D	25.40	61	23W0D	41	23W0D	182	23W2D	25	22W6D
135	27	1	0	152	Urban	Illiterate	Regular	22-11-2011	22W3D	22.30	57	23W2D	41	23W2D	183	22W5D	22	22W4D
136	24	1	0	151	Urban	Illiterate	Regular	08-12-2011	30W0D	32.60	77	30W2D	58	30W2D	220	31W2D	38	31W0D
137	20	2	1	155	Semi urban	Literate	Referred	14-09-2011	18W3D	21.00	44	18W5D	31	19W3D	133	19W4D	19	18W6D
138	22	1	0	160	Rural	Literate	Regular	24-07-2011	25W3D	24.90	60	25W1D	43	23W6D	204	25W1D	26	25W2D
139	21	3	2	154	Semi urban	Literate	Referred	06-03-2012	16W5D	18.20	37	17W2D	25	17W2D	133	16W4D	17	16W6D
140	28	2	1	167	Rural	Literate	Regular	26-02-2012	19W3D	18.90	46	19W3D	31	19W1D	133	18W5D	18	19W3D
141	25	1	0	157	Semi urban	Literate	Regular	06-03-2012	20W6D	22.20	49	20W5D	35	20W5D	162	21W2D	21	20W2D
142	22	1	0	161	Semi urban	Literate	Regular	19-08-2011	22W2D	22.90	49	22W2D	31	19W2D	153	20W2D	23	22W3D
143	21	2	1	167	Rural	Literate	Regular	02-07-2011	26W2D	28.30	61	23W5D	43	23W5D	187	23W6D	29	25W1D
144	18	2	1	167	Semi urban	Illiterate	Regular	10-10-2011	24W0D	25.30	56	23W1D	41	23W1D	177	22W2D	26	23W3D
145	18	1	0	168	Semi urban	Literate	Referred	14-08-2011	25W6D	28.30	68	26W2D	50	26W2D	225	27W3D	31	26W3D
146	26	2	1	169	Semi urban	Literate	Referred	03-07-2011	18W4D	19.80	43	18W6D	29	18W6D	134	18W6D	19	18W2D
147	18	1	0	158	Rural	Illiterate	Regular	05-07-2011	33W5D	34.60	79	32W1D	61	32W1D	265	31W5D	42	33W0D
148	20	1	0	149	Rural	Literate	Referred	27-08-2011	23W0D	23.50	55	21W6D	38	21W6D	160	21W1D	25	22W3D
149	27	2	1	149	Semi urban	Literate	Regular	06-08-2011	30W1D	31.80	81	30W4D	58	30W4D	288	30W1D	35	30W4D
150	18	1	0	159	Semi urban	Literate	Regular	08-06-2011	29W6D	33.00	76	30W5D	58	30W5D	248	30W0D	38	31W0D
151	23	1	0	165	Semi urban	Illiterate	Regular	17-06-2011	30W4D	32.30	78	30W0D	57	30W0D	255	29W5D	38	31W1D
152	22	2	1	161	Semi urban	Illiterate	Referred	07-01-2012	22W5D	22.00	54	23W0D	41	23W0D	186	22W3D	22	22W1D
153	22	1	0	151	Rural	Literate	Regular	02-03-2012	38W6D	38.40	90	38W4D	77	38W4D	322	38W6D	52	37W2D
154	25	1	0	153	Semi urban	Literate	Referred	01-04-2012	34W6D	37.20	87	35W4D	70	35W4D	308	35W1D	47	35W2D
155	23	1	0	150	Rural	Literate	Regular	13-08-2011	39W2D	40.60	90	38W2D	74	38W2D	332	37W1D	56	38W2D
156	24	3	0	147	Semi urban	Literate	Regular	15-10-2011	29W2D	30.20	76	28W4D	55	28W4D	240	28W1D	34	28W2D
157	22	1	0	165	Semi urban	Illiterate	Regular	27-07-2011	35W5D	37.00	88	33W5D	65	33W5D	296	33W4D	46	35W0D
158	19	1	0	156	Rural	Illiterate	Regular	01-01-2012	31W0D	33.90	78	31W5D	61	31W5D	227	31W3D	41	31W0D
159	22	1	0	159	Semi urban	Illiterate	Regular	24-07-2011	27W4D	29.30	71	27W0D	51	27W0D	237	29W0D	32	27W3D
160	20	2	1	168	Rural	Illiterate	Regular	29-02-2012	33W3D	35.80	85	34W2D	67	34W2D	302	34W1D	42	33W0D
161	28	1	0	151	Semi urban	Illiterate	Referred	21-02-2012	38W0D	39.80	90	38W2D	69	36W4D	302	36W2D	53	37W4D
162	25	2	1	170	Rural	Literate	Regular	26-11-2011	21W2D	23.80	46	21W0D	33	20W0D	159	21W0D	23	21W4D
163	19	3	2	156	Semi urban	Literate	Regular	19-07-2011	31W0D	34.80	81	32W3D	58	32W3D	288	31W4D	39	31W6D
164	24	1	0	154	Rural	Literate	Regular	26-06-2011	22W5D	24.20	61	23W0D	41	23W0D	182	23W2D	25	22W6D

165	18	1	0	165	Rural	Literate	Regular	18-08-2011	22W3D	23.10	57	23W2D	41	23W2D	183	22W3D	22	22W1D
166	28	1	0	152	Rural	Illiterate	Regular	08-06-2011	30W0D	33.80	77	30W2D	58	30W2D	220	31W4D	38	31W0D
167	20	3	0	157	Rural	Literate	Regular	18-03-2012	18W3D	21.00	44	18W4D	31	19W4D	132	19W4D	19	18W6D
168	19	2	1	153	Semi urban	Literate	Referred	17-10-2011	25W3D	26.10	60	25W2D	43	23W6D	204	25W1D	26	25W3D
169	28	1	0	160	Rural	Illiterate	Regular	06-11-2011	16W5D	19.00	37	17W3D	25	17W3D	133	16W4D	17	16W6D
170	28	2	0	167	Semi urban	Illiterate	Regular	05-07-2011	19W3D	20.10	46	19W2D	31	19W1D	133	18W5D	18	19W4D
171	20	1	0	154	Semi urban	Illiterate	Referred	09-03-2012	20W6D	21.40	49	20W5D	35	20W5D	162	21W2D	21	20W2D
172	20	1	0	158	Rural	Literate	Regular	30-06-2011	22W2D	23.30	49	22W2D	31	19W2D	153	20W2D	23	22W3D
173	25	3	2	150	Semi urban	Literate	Regular	17-01-2012	26W2D	26.30	61	23W5D	43	23W5D	187	23W6D	29	25W1D
174	19	1	0	158	Semi urban	Literate	Regular	08-07-2011	24W0D	25.70	56	23W1D	41	23W1D	177	22W2D	26	23W3D
175	25	1	0	162	Semi urban	Illiterate	Regular	13-01-2012	25W6D	28.30	68	26W2D	50	26W2D	225	27W3D	31	26W3D
176	28	2	0	166	Rural	Illiterate	Referred	21-06-2011	18W4D	20.60	43	18W6D	29	18W6D	134	18W6D	19	18W2D
177	27	1	0	159	Rural	Illiterate	Referred	31-12-2011	33W5D	35.40	79	32W1D	61	32W1D	265	31W5D	42	33W0D
178	23	1	0	169	Rural	Literate	Regular	28-08-2011	23W0D	23.90	55	21W6D	38	21W6D	160	21W1D	25	22W3D
179	28	1	0	165	Semi urban	Literate	Referred	01-03-2012	30W1D	32.20	81	30W4D	58	30W4D	288	31W1D	35	31W0D
180	27	2	1	160	Semi urban	Illiterate	Referred	23-02-2012	29W6D	32.20	76	30W5D	58	30W5D	248	30W0D	38	31W0D
181	21	1	0	171	Rural	Literate	Regular	02-11-2011	30W4D	29.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
182	28	1	0	173	Semi urban	Literate	Regular	21-10-2011	22W5D	19.20	54	23W0D	41	23W0D	186	22W2D	22	22W0D
183	18	1	0	148	Rural	Literate	Referred	10-07-2011	38W6D	36.00	90	38W4D	77	38W4D	322	38W6D	52	37W2D
184	27	1	0	160	Semi urban	Literate	Regular	06-11-2011	34W6D	33.60	87	35W4D	70	35W4D	308	35W1D	47	35W2D
185	18	2	1	166	Semi urban	Illiterate	Referred	01-02-2012	39W2D	36.60	90	38W2D	74	38W2D	332	37W1D	56	38W2D
186	20	1	0	160	Rural	Literate	Regular	27-09-2011	29W2D	27.40	76	28W4D	55	28W4D	240	28W1D	34	28W2D
187	20	3	1	160	Rural	Literate	Referred	04-01-2012	35W5D	33.00	88	33W5D	65	33W5D	296	33W4D	46	35W0D
188	22	2	1	159	Rural	Literate	Regular	17-02-2012	31W0D	29.50	78	31W5D	61	31W5D	227	31W3D	41	31W4D
189	22	1	0	165	Semi urban	Literate	Regular	12-11-2011	27W4D	26.10	71	27W0D	51	27W0D	237	29W0D	32	27W3D
190	28	2	1	156	Rural	Literate	Regular	19-11-2011	33W3D	30.20	85	34W2D	67	34W2D	302	34W1D	42	33W0D
191	28	1	0	157	Rural	Illiterate	Referred	30-11-2011	38W0D	35.00	90	38W2D	69	36W4D	302	36W2D	53	37W4D
192	22	1	0	163	Rural	Literate	Regular	04-12-2011	21W2D	18.20	46	20W0D	33	20W0D	159	21W0D	23	21W4D
193	20	1	0	155	Rural	Literate	Regular	30-07-2011	31W0D	29.60	81	32W3D	58	32W3D	288	31W4D	39	31W6D
194	25	3	2	153	Rural	Illiterate	Regular	08-10-2011	22W5D	21.00	61	23W1D	41	23W0D	182	23W2D	25	22W6D
195	19	1	0	170	Semi urban	Literate	Regular	28-03-2012	22W3D	19.10	57	23W2D	41	23W2D	183	22W0D	22	22W5D
196	19	2	1	158	Semi urban	Literate	Regular	07-12-2011	30W0D	28.60	77	30W2D	58	30W2D	220	31W1D	38	31W0D
197	27	1	0	161	Rural	Illiterate	Regular	15-06-2011	18W3D	17.40	45	18W9	31	18W9	135	19W1D	19	18W6D
198	24	1	0	149	Semi urban	Illiterate	Referred	17-03-2012	25W3D	22.50	60	25W2D	43	23W6D	204	25W1D	26	25W2D

199	18	1	0	151	Semi urban	Illiterate	Referred	06-01-2012	16W5D	14.20	37	17W2D	25	17W2D	133	16W4D	17	16W6D
200	23	3	1	156	Semi urban	Illiterate	Regular	19-07-2011	19W3D	16.90	46	19W1D	31	19W1D	133	18W5D	18	19W2D
201	25	1	0	157	Rural	Literate	Regular	23-02-2012	20W6D	17.40	49	20W5D	35	20W5D	162	21W2D	21	20W2D
202	32	2	1	166	Rural	Illiterate	Regular	16-12-2011	22W2D	18.50	49	22W3D	31	19W2D	153	20W2D	23	22W3D
203	31	1	0	166	Semi urban	Literate	Regular	17-10-2011	26W2D	22.30	61	23W5D	43	23W5D	187	23W6D	29	25W1D
204	25	3	1	152	Semi urban	Literate	Regular	16-02-2012	24W0D	22.50	56	23W0D	41	23W1D	177	22W2D	26	23W3D
205	24	1	0	162	Rural	Illiterate	Referred	16-10-2011	25W6D	24.70	68	26W2D	50	26W2D	225	27W3D	31	26W3D
206	27	1	0	150	Semi urban	Illiterate	Regular	13-12-2011	18W4D	15.80	43	18W6D	29	18W6D	134	18W6D	19	18W2D
207	26	3	2	151	Rural	Literate	Referred	25-06-2011	33W5D	31.40	79	32W1D	61	32W1D	265	31W5D	42	33W0D
208	26	1	0	158	Semi urban	Illiterate	Referred	19-08-2011	23W0D	21.10	55	22W2D	38	21W6D	160	21W1D	25	22W3D
209	25	5	1	167	Semi urban	Illiterate	Regular	25-09-2011	30W1D	28.60	81	30W4D	58	30W4D	288	30W0D	35	30W1D
210	28	1	0	166	Semi urban	Literate	Regular	15-09-2011	29W6D	29.80	76	30W5D	58	30W5D	248	30W0D	38	31W0D
211	25	1	0	149	Semi urban	Literate	Referred	02-07-2011	30W4D	27.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
212	24	2	1	167	Semi urban	Literate	Referred	17-08-2011	22W5D	19.60	54	23W1D	41	23W0D	186	22W1D	22	22W3D
213	29	3	2	156	Semi urban	Literate	Regular	31-03-2012	38W6D	36.40	90	38W4D	77	38W4D	322	38W6D	52	37W2D
214	24	1	0	165	Rural	Illiterate	Referred	09-02-2012	34W6D	33.60	87	35W4D	70	35W4D	308	35W1D	47	35W2D
215	28	2	1	168	Semi urban	Literate	Regular	26-09-2011	39W2D	36.60	90	38W2D	74	38W2D	332	37W1D	56	38W2D
216	32	3	1	165	Rural	Illiterate	Referred	09-09-2011	29W2D	25.80	76	28W4D	55	28W4D	240	28W1D	34	28W2D
217	25	1	0	168	Rural	Illiterate	Regular	11-10-2011	35W5D	33.40	88	33W5D	65	33W5D	296	33W4D	46	35W0D
218	25	2	0	158	Semi urban	Literate	Regular	24-01-2012	31W0D	29.50	78	31W5D	61	31W5D	227	31W3D	41	31W4D
219	25	1	0	154	Semi urban	Literate	Referred	24-07-2011	27W4D	25.30	71	27W0D	51	27W0D	237	29W0D	32	27W3D
220	27	3	1	155	Rural	Literate	Regular	12-07-2011	33W3D	31.40	85	34W2D	67	34W2D	302	34W1D	42	33W0D
221	26	2	0	156	Rural	Illiterate	Referred	19-11-2011	38W0D	34.20	90	38W2D	69	36W4D	302	36W2D	53	37W4D
222	32	1	0	152	Rural	Literate	Referred	09-06-2011	21W2D	19.80	46	20W0D	33	20W0D	159	21W0D	23	21W4D
223	32	2	1	164	Rural	Illiterate	Regular	17-08-2011	38W0D	35.80	90	38W2D	69	36W4D	302	36W2D	53	37W4D
224	30	1	0	170	Semi urban	Literate	Regular	07-11-2011	21W2D	19.80	46	20W0D	33	20W0D	159	21W0D	23	21W4D
225	29	2	1	166	Semi urban	Literate	Regular	31-01-2012	31W0D	30.40	81	32W3D	58	32W3D	288	31W4D	39	31W6D
226	24	1	0	170	Semi urban	Illiterate	Regular	23-06-2011	22W5D	20.20	61	23W7	41	23W0D	182	23W2D	25	22W6D
227	28	1	0	162	Rural	Illiterate	Regular	11-03-2012	22W3D	19.90	57	23W2D	41	23W2D	183	22W5D	22	22W1D
228	24	2	1	162	Rural	Literate	Referred	18-07-2011	30W0D	29.40	77	30W2D	58	30W2D	220	29W6D	38	31W0D
229	32	1	0	150	Semi urban	Illiterate	Referred	13-09-2011	18W3D	17.00	45	19W0D	31	19W0D	137	19W1D	19	18W6D
230	32	1	0	164	Rural	Illiterate	Referred	08-07-2011	25W3D	21.70	60	25W0D	43	23W6D	204	25W1D	26	25W2D
231	25	2	1	159	Semi urban	Literate	Regular	06-09-2011	16W5D	15.40	37	17W2D	25	17W2D	133	16W4D	17	16W6D
232	30	1	0	155	Rural	Illiterate	Referred	06-10-2011	19W3D	16.10	46	19W3D	31	19W1D	133	18W5D	18	19W3D

233	24	2	1	157	Semi urban	Illiterate	Referred	15-12-2011	20W6D	18.60	49	20W5D	35	20W5D	162	21W2D	21	20W2D
234	28	1	0	153	Semi urban	Illiterate	Regular	12-10-2011	22W2D	19.70	49	22W2D	31	19W2D	153	20W2D	23	22W3D
235	28	2	1	160	Semi urban	Literate	Regular	26-02-2012	26W2D	22.30	61	23W5D	43	23W5D	187	23W6D	29	25W1D
236	30	1	0	162	Semi urban	Illiterate	Referred	16-11-2011	24W0D	22.10	56	23W0D	41	23W1D	177	22W2D	26	23W3D
237	27	5	1	158	Rural	Literate	Referred	12-12-2011	25W6D	23.90	68	26W2D	50	26W2D	225	27W3D	31	26W3D
238	31	3	2	153	Rural	Literate	Regular	21-02-2012	18W4D	16.20	43	18W6D	29	18W6D	134	18W6D	19	18W2D
239	26	2	1	154	Rural	Literate	Referred	10-12-2011	33W5D	30.60	79	32W1D	61	32W1D	265	31W5D	42	33W0D
240	30	1	0	164	Semi urban	Literate	Regular	13-03-2012	23W0D	19.90	55	22W1D	38	21W6D	160	21W1D	25	22W3D
241	29	3	1	164	Rural	Literate	Referred	25-11-2011	30W1D	28.20	81	30W4D	58	30W4D	288	30W1D	35	30W4D
242	26	1	0	164	Semi urban	Literate	Regular	18-09-2011	29W6D	29.40	76	30W5D	58	30W5D	248	30W0D	38	31W0D
243	26	1	0	169	Semi urban	Illiterate	Regular	28-11-2011	30W4D	29.10	78	30W0D	57	30W0D	255	29W5D	38	31W1D
244	29	1	0	168	Rural	Illiterate	Regular	08-01-2012	22W5D	18.80	54	24W0D	41	23W0D	186	22W6D	22	22W6D
245	25	1	0	152	Semi urban	Illiterate	Regular	03-09-2011	38W6D	35.20	90	38W4D	77	38W4D	322	38W6D	52	37W2D
246	26	3	1	154	Semi urban	Illiterate	Referred	23-03-2012	34W6D	33.20	87	35W4D	70	35W4D	308	35W1D	47	35W2D
247	32	1	0	168	Semi urban	Literate	Referred	08-11-2011	39W2D	36.60	90	38W2D	74	38W2D	332	37W1D	56	38W2D
248	24	1	0	152	Semi urban	Literate	Regular	11-06-2011	29W2D	26.60	76	28W4D	55	28W4D	240	28W1D	34	28W2D
249	29	3	2	152	Semi urban	Literate	Regular	28-09-2011	35W5D	33.00	88	33W5D	65	33W5D	296	33W4D	46	35W0D
250	24	1	0	163	Semi urban	Illiterate	Regular	16-09-2011	38W0D	34.20	90	38W2D	69	36W4D	302	36W2D	53	37W4D
251	27	5	1	164	Rural	Literate	Regular	28-02-2012	21W2D	20.20	46	20W0D	33	20W0D	159	21W0D	23	21W4D
252	28	1	0	158	Semi urban	Literate	Regular	03-09-2011	31W0D	30.00	81	32W3D	58	32W3D	288	31W4D	39	31W6D
253	25	1	0	164	Semi urban	Literate	Regular	27-12-2011	22W5D	20.20	61	23W6D	41	23W0D	182	23W2D	25	22W6D
254	32	2	1	157	Rural	Literate	Referred	17-11-2011	22W3D	19.50	57	23W2D	41	23W2D	183	22W1D	22	22W0D
255	25	3	2	166	Rural	Literate	Regular	24-07-2011	30W0D	28.60	77	30W2D	58	30W2D	220	29W8	38	31W0D
256	28	1	0	163	Rural	Illiterate	Referred	26-02-2012	18W3D	15.30	45	19W3D	31	19W3D	136	19W4D	19	18W5D
257	26	2	1	167	Rural	Literate	Regular	15-01-2012	25W3D	21.30	60	25W1D	43	23W6D	204	25W1D	26	25W1D
258	24	3	1	163	Semi urban	Illiterate	Regular	02-03-2012	16W5D	15.80	37	17W1D	25	17W1D	133	16W4D	17	16W6D
259	26	1	0	165	Semi urban	Illiterate	Regular	24-08-2011	19W3D	15.70	46	19W3D	31	19W1D	133	18W5D	18	19W2D
260	26	2	0	154	Rural	Illiterate	Referred	19-07-2011	20W6D	18.20	49	20W5D	35	20W5D	162	21W2D	21	20W2D
261	28	1	0	154	Rural	Illiterate	Regular	09-12-2011	22W2D	19.70	49	22W1D	31	19W2D	153	20W2D	23	22W3D
262	27	3	1	166	Semi urban	Literate	Referred	19-03-2012	26W2D	23.50	61	23W5D	43	23W5D	187	23W6D	29	25W1D
263	26	2	0	165	Rural	Literate	Regular	25-06-2011	24W0D	20.90	56	23W0D	41	23W1D	177	22W2D	26	23W3D
264	29	1	0	154	Rural	Literate	Regular	24-08-2011	25W6D	23.90	68	26W2D	50	26W2D	225	27W3D	31	26W3D
265	26	2	1	168	Rural	Literate	Referred	18-02-2012	18W4D	16.60	43	18W6D	29	18W6D	134	18W6D	19	18W2D
266	27	1	0	150	Rural	Literate	Referred	18-01-2012	33W5D	30.60	79	32W1D	61	32W1D	265	31W5D	42	33W0D

267	28	2	1	167	Semi urban	Illiterate	Referred	10-02-2012	23W0D	19.10	55	22W1D	38	21W6D	160	21W1D	25	22W3D
268	32	1	0	159	Rural	Literate	Referred	09-10-2011	30W1D	26.60	81	30W4D	58	30W4D	288	30W2D	35	30W4D
269	31	1	0	163	Rural	Illiterate	Regular	23-01-2012	29W6D	29.40	76	30W5D	58	30W5D	248	30W0D	38	31W0D
270	31	2	1	150	Rural	Illiterate	Regular	17-09-2011	30W4D	29.10	78	30W0D	57	30W0D	255	29W5D	38	31W1D
271	24	1	0	166	Rural	Illiterate	Referred	09-02-2012	22W5D	17.60	54	24W0D	41	23W0D	186	22W1D	22	22W2D
272	30	1	0	163	Rural	Illiterate	Referred	09-08-2011	38W6D	34.80	90	38W4D	77	38W4D	322	38W6D	52	37W2D
273	29	2	1	167	Rural	Literate	Regular	09-03-2012	34W6D	33.20	87	35W4D	70	35W4D	308	35W1D	47	35W2D
274	27	1	0	158	Rural	Illiterate	Referred	13-09-2011	39W2D	35.40	90	38W2D	74	38W2D	332	37W1D	56	38W2D
275	30	2	1	159	Rural	Literate	Referred	19-12-2011	29W2D	26.20	76	28W4D	55	28W4D	240	28W1D	34	28W2D
276	31	1	0	166	Semi urban	Literate	Referred	17-12-2011	35W5D	33.00	88	33W5D	65	33W5D	296	33W4D	46	35W0D
277	35	2	1	156	Rural	Illiterate	Regular	04-01-2012	31W0D	31.10	78	31W5D	61	31W5D	227	31W3D	41	31W2D
278	33	1	0	150	Rural	Literate	Referred	25-12-2011	27W4D	24.90	71	27W0D	51	27W0D	237	29W0D	32	27W3D
279	30	5	1	167	Semi urban	Illiterate	Referred	19-10-2011	33W3D	31.00	85	34W2D	67	34W2D	302	34W1D	42	33W0D
280	28	3	2	168	Semi urban	Literate	Referred	23-08-2011	38W0D	35.40	90	38W2D	69	36W4D	302	36W2D	53	37W4D
281	35	2	1	168	Rural	Literate	Referred	26-06-2011	21W2D	19.80	46	20W0D	33	20W0D	159	21W0D	23	21W4D
282	28	1	0	147	Rural	Literate	Regular	06-08-2011	31W0D	30.40	81	32W3D	58	32W3D	288	31W4D	39	31W6D
283	33	3	1	163	Semi urban	Literate	Referred	03-01-2012	22W5D	21.00	61	23W1D	41	23W0D	182	23W2D	25	22W6D
284	31	1	0	154	Rural	Illiterate	Regular	15-03-2012	38W0D	34.60	90	38W2D	69	36W4D	302	36W2D	53	37W4D
285	28	1	0	167	Semi urban	Literate	Regular	25-03-2012	21W2D	19.00	46	20W0D	33	20W0D	159	21W0D	23	21W4D
286	30	1	0	160	Rural	Illiterate	Referred	12-11-2011	31W0D	30.80	81	32W3D	58	32W3D	288	31W4D	39	31W6D
287	32	1	0	168	Semi urban	Literate	Referred	10-06-2011	22W5D	20.60	61	23W0D	41	23W0D	182	23W2D	25	22W6D
288	30	2	1	156	Rural	Illiterate	Regular	12-02-2012	22W3D	19.90	57	23W2D	41	23W2D	183	22W1D	22	22W3D
289	31	4	0	159	Semi urban	Literate	Regular	14-07-2011	30W0D	28.20	77	30W2D	58	30W2D	220	31W1D	38	31W0D
290	34	1	0	164	Rural	Literate	Regular	20-09-2011	18W3D	16.50	44	19W1D	31	19W1D	136	19W0D	19	18W5D
291	29	2	1	157	Semi urban	Literate	Referred	10-09-2011	25W3D	22.50	60	25W1D	43	23W6D	204	25W1D	26	25W1D
292	28	2	1	162	Semi urban	Literate	Referred	28-01-2012	16W5D	14.60	37	17W2D	25	17W2D	133	16W4D	17	16W6D
293	34	5	1	161	Rural	Illiterate	Referred	27-12-2011	19W3D	15.70	46	19W4D	31	19W1D	133	18W5D	18	19W3D
294	31	3	2	150	Semi urban	Literate	Regular	24-10-2011	20W6D	17.40	49	20W5D	35	20W5D	162	21W2D	21	20W2D
295	35	2	0	159	Semi urban	Literate	Referred	22-07-2011	22W2D	18.50	49	22W2D	31	19W2D	153	20W2D	23	22W0D
296	33	1	0	161	Semi urban	Illiterate	Referred	01-07-2011	26W2D	23.50	61	23W5D	43	23W5D	187	23W6D	29	25W1D
297	30	1	0	151	Semi urban	Literate	Referred	25-12-2011	24W0D	21.30	56	23W1D	41	23W1D	177	22W2D	26	23W3D
298	33	3	1	156	Semi urban	Literate	Referred	15-09-2011	25W6D	23.90	68	26W2D	50	26W2D	225	27W3D	31	26W3D
299	30	1	0	171	Rural	Illiterate	Referred	28-01-2012	18W4D	16.20	43	18W6D	29	18W6D	134	18W6D	19	18W2D
300	34	2	1	162	Rural	Literate	Regular	06-08-2011	33W5D	30.60	79	32W1D	61	32W1D	265	31W5D	42	33W0D

301	29	2	1	160	Rural	Illiterate	Regular	10-01-2012	23W0D	20.30	55	21W6D	38	21W6D	160	21W1D	25	22W3D
302	32	1	0	153	Semi urban	Illiterate	Referred	20-11-2011	30W1D	26.60	81	30W4D	58	30W4D	288	30W1D	35	30W6D
303	30	2	1	156	Semi urban	Illiterate	Referred	07-03-2012	29W6D	29.00	76	30W5D	58	30W5D	248	30W0D	38	31W0D
304	34	2	1	158	Rural	Literate	Referred	07-10-2011	30W4D	29.90	78	30W0D	57	30W0D	255	29W5D	38	31W1D
305	32	1	0	165	Semi urban	Literate	Referred	09-10-2011	22W5D	18.80	54	22W2D	41	23W0D	186	22W0D	22	22W4D
306	32	2	1	158	Rural	Illiterate	Regular	26-08-2011	38W6D	34.00	90	38W2D	77	38W4D	322	38W6D	52	37W2D
307	34	1	0	153	Rural	Literate	Referred	10-11-2011	34W6D	33.20	87	35W0D	70	35W4D	308	35W1D	47	35W2D
308	28	3	2	160	Semi urban	Literate	Referred	30-10-2011	39W2D	36.60	90	39W0D	74	38W2D	332	37W1D	56	38W2D
309	33	4	1	158	Rural	Illiterate	Referred	23-12-2011	29W2D	26.60	76	30W0D	55	28W4D	240	28W1D	34	29W5D
310	32	1	0	163	Rural	Literate	Referred	20-08-2011	35W5D	33.80	88	34W2D	65	33W5D	296	33W4D	46	35W0D
311	32	1	0	166	Semi urban	Literate	Regular	24-10-2011	31W0D	31.10	78	31W0D	61	31W5D	227	31W3D	41	31W4D
312	35	1	0	170	Rural	Literate	Regular	17-07-2011	27W4D	26.50	71	27W5D	51	27W0D	237	29W0D	32	27W3D
313	29	3	0	171	Semi urban	Literate	Referred	11-02-2012	33W3D	30.60	85	34W2D	67	34W2D	302	34W1D	42	33W0D
314	35	2	1	145	Semi urban	Literate	Referred	01-07-2011	38W0D	36.20	90	39W0D	69	36W4D	302	36W2D	53	37W4D
315	35	1	0	152	Semi urban	Literate	Referred	09-07-2011	21W2D	19.00	46	19W1D	33	20W0D	159	21W0D	23	21W4D
316	30	2	0	161	Semi urban	Illiterate	Regular	18-11-2011	31W0D	30.00	81	32W1D	58	32W3D	288	31W4D	39	31W6D
317	29	1	0	166	Rural	Illiterate	Referred	01-08-2011	22W5D	21.40	61	24W0D	41	23W0D	182	23W2D	25	22W6D
318	34	1	0	155	Semi urban	Illiterate	Regular	04-03-2012	38W0D	35.40	90	39W0D	69	36W4D	302	36W2D	53	37W4D
319	32	3	2	167	Semi urban	Illiterate	Referred	21-01-2012	21W2D	19.00	46	19W1D	33	20W0D	159	21W0D	23	21W4D
320	31	1	0	159	Semi urban	Literate	Regular	20-03-2012	31W0D	28.80	81	32W1D	58	32W3D	288	31W4D	39	31W6D
321	35	1	0	159	Semi urban	Literate	Regular	07-10-2011	22W5D	20.20	61	24W0D	41	23W0D	182	23W2D	25	22W6D
322	31	2	0	167	Rural	Illiterate	Regular	12-03-2012	22W3D	19.50	57	23W2D	41	23W2D	183	22W0D	22	22W4D
323	18	1	0	163	Semi urban	Illiterate	Referred	09-01-2012	30W0D	29.40	77	30W6D	58	30W2D	220	31W0D	38	31W0D
324	27	1	0	169	Semi urban	Literate	Referred	04-03-2012	18W3D	17.30	44	19W2D	31	19W2D	136	19W0D	19	18W5D
325	21	1	0	162	Semi urban	Literate	Referred	06-09-2011	25W3D	20.90	60	25W4D	43	23W6D	204	25W1D	26	25W3D
326	20	2	1	169	Rural	Literate	Referred	24-12-2011	16W5D	14.60	37	17W3D	25	17W1D	133	16W4D	17	16W6D
327	22	1	0	166	Rural	Literate	Regular	02-08-2011	19W3D	16.10	46	19W1D	31	19W1D	133	18W5D	18	19W1D
328	19	1	0	164	Rural	Illiterate	Referred	31-10-2011	20W6D	17.40	49	20W1D	35	20W5D	162	21W2D	21	20W2D
329	26	1	0	165	Semi urban	Literate	Regular	01-07-2011	22W2D	19.70	49	20W1D	31	19W2D	153	20W2D	23	21W3D
330	19	1	0	159	Semi urban	Illiterate	Referred	25-12-2011	26W2D	22.30	61	24W0D	43	23W5D	187	23W6D	29	25W1D
331	28	2	1	159	Rural	Illiterate	Referred	29-07-2011	24W0D	22.10	56	23W0D	41	23W1D	177	22W2D	26	23W3D
332	27	1	0	154	Semi urban	Illiterate	Referred	17-10-2011	25W6D	24.30	68	26W6D	50	26W2D	225	27W3D	31	26W3D
333	19	3	1	165	Rural	Literate	Regular	02-08-2011	18W4D	15.40	43	18W2D	29	18W6D	134	18W6D	19	18W2D
334	24	2	1	167	Semi urban	Illiterate	Referred	11-12-2011	33W5D	30.20	79	31W0D	61	32W1D	265	31W5D	42	33W0D

335	24	1	0	151	Semi urban	Literate	Regular	26-06-2011	23W0D	19.10	55	22W0D	38	21W6D	160	21W1D	25	22W3D
336	28	1	0	164	Semi urban	Literate	Regular	07-09-2011	30W1D	26.20	81	31W6D	58	30W4D	288	34W2D	35	29W4D
337	25	3	0	165	Rural	Literate	Regular	06-08-2011	29W6D	28.20	76	30W6D	58	30W5D	248	30W0D	38	31W0D
338	28	2	1	165	Rural	Illiterate	Regular	10-06-2011	30W4D	28.70	78	31W4D	57	30W0D	255	29W5D	38	31W1D
339	18	1	0	158	Semi urban	Literate	Regular	28-09-2011	22W5D	19.20	54	22W0D	41	23W0D	186	22W1D	22	22W5D
340	28	2	0	168	Semi urban	Illiterate	Regular	07-06-2011	38W6D	35.20	90	38W2D	77	38W4D	322	38W6D	52	37W2D
341	18	1	0	154	Rural	Illiterate	Regular	18-08-2011	34W6D	34.00	87	35W0D	70	35W4D	308	35W1D	47	35W2D
342	25	1	0	160	Rural	Literate	Regular	09-01-2012	39W2D	36.20	90	39W0D	74	38W2D	332	37W1D	56	38W2D
343	18	3	2	170	Urban	Literate	Regular	30-12-2011	29W2D	26.20	77	29W2D	55	28W4D	240	28W1D	22	28W2D
344	24	1	0	161	Rural	Illiterate	Referred	25-12-2011	35W5D	33.80	88	34W2D	65	33W5D	296	33W4D	46	35W0D
345	20	1	0	147	Rural	Illiterate	Referred	05-07-2011	31W0D	30.30	78	31W0D	61	31W5D	227	31W3D	41	28W4D
346	19	2	0	149	Semi urban	Literate	Regular	10-09-2011	27W4D	24.10	71	27W5D	51	27W0D	237	29W0D	32	27W3D
347	20	1	0	159	Urban	Illiterate	Regular	14-08-2011	33W3D	31.40	85	34W2D	67	34W2D	302	34W1D	42	33W0D
348	18	1	0	163	Urban	Literate	Referred	29-01-2012	38W0D	36.20	90	39W0D	69	36W4D	302	36W2D	53	37W4D
349	25	1	0	158	Urban	Literate	Regular	02-12-2011	21W2D	19.40	46	19W1D	33	20W0D	159	21W0D	23	21W4D
350	22	1	0	151	Urban	Illiterate	Regular	22-10-2011	31W0D	29.60	81	32W1D	58	32W3D	288	31W4D	39	31W6D